# ANNAMALAI UNIVERSITY

## FACULTY OF ENGINEERING AND TECHNOLOGY

# B.E. COMPUTER SCIENCE AND ENGINEERING

# Regulations & Curriculum – 2016

# HAND BOOK
# 2016

**ANNAMALAI UNIVERSITY**

**DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING**

**B.E. COMPUTER SCIENCE & ENGINEERING**

**(Four Year Degree Programme) (FULL–TIME)**

**Choice Based Credit System**

**REGULATION 2016**

## 1. Condition for Admission

Candidates for admission to the first year of the four year B.E. Degree programmes shall be required to have passed the final examination of the plus 2 Higher Secondary Course with Mathematics, Physics and Chemistry as subjects of study and candidates who have passed the Higher Secondary Examination through vocational stream under Engineering, conducted by the Board of Secondary Education, Government of Tamil Nadu or an examination of any other authority accepted by the Syndicate of this University as equivalent thereto. They shall satisfy the conditions regarding qualifying marks, age and physical fitness as may be prescribed by the Syndicate of the Annamalai University from time to time.

Candidates who have passed the Diploma course in Engineering of the State Board of Technical Education, Tamil Nadu (listed in Annexure-1) will be eligible for admission to the second year of the four year degree programme in B.E. under the lateral entry scheme provided they satisfy other conditions.

## 2. Branches of Study in B.E.

| | | |
|---|---|---|
| BRANCH I | - | Civil Engineering |
| BRANCH II | - | Civil and Structural Engineering |
| BRANCH III | - | Mechanical Engineering |
| BRANCH IV | - | Mechanical Engineering (Manufacturing) |
| BRANCH V | - | Electrical and Electronics Engineering |
| BRANCH VI | - | Electronics and Instrumentation Engineering |
| BRANCH VII | - | Chemical Engineering |
| BRANCH VIII | - | Computer Science and Engineering |
| BRANCH IX | - | Information Technology |
| BRANCH X | - | Electronics and Communication Engineering |

## 3. Courses of study

The courses of study and the respective syllabi are given separately.

## 4. Scheme of Examinations

The scheme of Examinations is given separately.

## 5. Choice Based Credit System (CBCS)

The curriculum includes six components namely Humanities/Social Sciences/Management, Basic Sciences, Engineering Sciences, Professional Core, Professional Electives and Open Electives in addition to Seminar & Industrial Training and Project. Each semester curriculum shall normally have a blend of theory and practical

courses. The total credits for the entire degree Programme is 176 (135 for lateral entry students).

**6. Eligibility for the Degree**

A candidate shall be eligible for the degree of Bachelor of Engineering if the candidate has satisfactorily undergone the prescribed courses of study for a period of four academic years and has passed the prescribed examinations in all the four academic years. For the award of the degree, a student has to

1. Earn a minimum of 176 credits (135 for lateral entry students).
2. Serve in any one of the Co-curricular activities such as
    - National Cadet Corps (NCC)
    - National Service Scheme (NSS)
    - National Sports Organization (NSO) and
    - Youth Red Cross (YRC)

for at least one year. The students enrolled in any one of the co-curricular activities ( NCC / NSS / NSO / YRC ) will undergo training for about 80 hours and attend a camp of about seven days. The training shall include classes on hygiene and health awareness and also training in first-aid. While the training activities will normally be during weekends, the camp will normally be during vacation period.

(OR)

Enroll as a student member of a recognized professional society such as

- Student Chapters of Institution of Engineers (India)
- Student Chapters of other Professional bodies like ICI, ISA, IIChE

**7. Assignment of Credits for Courses**

Each course is normally assigned one credit per hour of lecture / tutorial per week and one credit for two hours or part thereof for laboratory or practical or drawing per week.

**8. Duration of the programme**

A student is normally expected to complete the B.E. programme in four years but in any case not more than eight years from the time of admission.

**9. Registration for courses**

A newly admitted student will automatically be registered for all the courses prescribed for the first, second and third semesters without any option.

Every other student shall enroll for the courses intended to be credited in the succeeding semester in the current semester itself by completing the registration form indicating the list of courses. This registration will be done a week before the last working day of the current semester.

A student is required to earn 176 (135 for lateral entry students) credits in order to be eligible for obtaining the degree. However the student is entitled to enjoy an option to earn either more or less than the total number of credits prescribed in the curriculum of a particular semester on the following guidelines:

The **slow learners** may be allowed to withdraw certain courses with the approval by Head of the Department and those courses may be completed by them in the fifth year of study and still they are eligible to be awarded with I Class. A student can withdraw a maximum of 2 courses per semester from IV semester to VII semester and take up those courses in the fifth year of study. However, courses withdrawn during odd semesters (V and VII) must be registered in the odd semester of fifth year and courses withdrawn during even semesters (IV and VI) must be registered in the even semester of fifth year.

The **advance learners** may be allowed to take up the open elective subjects of eighth semester in sixth and seventh semesters one in each to enable them to pursue industrial training / project work in the entire eighth semester period provided they should register those courses in the fifth semester itself. Such students should meet the teachers offering those elective courses themselves for clarifications. No specific slots will be allotted in the time table for such courses.

**10. Seminar / Industrial Training**

The student has to present a seminar on the chosen topic. However, the student can select a topic duly approved by the Seminar Coordinator and the Head of the Department concerned. The student who has presented the seminar has to submit a report and appear for viva-voce examination at the end of the semester.

**11. Project Work**

The student typically registers for project at the end of seventh semester and completes it at the end of the eighth semester along with the courses prescribed for study in the eighth semester. However a student who has registered and successfully completed the courses of eighth semester by acquiring additional credits in the earlier semesters can attempt to spend his / her period of study in an industry and complete his / her project work, submit the project report and appear for viva-voce examination at the end of eighth semester.

**12. Industrial Training (Value added courses)**

One credit courses shall be offered by a Department with the prior approval from the Dean, Faculty of Engineering and Technology. For one credit course, a relevant potential topic may be selected by a committee consisting of Head of the department concerned and the Board of Studies member from the Department and a senior faculty member from the department concerned. An expert from industry familiar with the topic chosen may be accordingly invited to handle classes for the students. The details of the syllabus, time table and the name of the industrial expert may be sent by the above committee to the Dean for approval. The credits earned through the one credit courses shall be over and above the total credit requirement prescribed in the curriculum for the award of the degree. Students can take a maximum of two one credit courses (one each in VI and VII semesters). They shall be allowed to take one credit courses offered in other Departments with the permission of Head of the Department offering the course. A separate mark sheet shall be issued for one credit courses.

## 13. Electives

The elective courses fall under two categories: Professional Electives and Open Electives. The Professional Elective courses are offered in the concerned branch of specialization and a student can choose the Professional Elective courses with the approval of the Head of the Department concerned. Apart from the various Professional elective courses, a student can choose the open electives from any specialization offered in any Department in the Faculty of Engineering & Technology during the entire period of study, with the approval of the Head of the Department and the Head of the Department offering the course.

Further, the student can also credit not more than two courses offered through the SWAYAM Portal of UGC with the approval of the Head of the Department concerned. These courses will be considered as equivalent of open electives.

## 14. Assessment

The break-up of continuous assessment and examination marks for theory courses is as follows:

| | |
|---|---|
| First assessment (Mid-Semester Test-I) | : 10 marks |
| Second assessment (Mid-Semester Test-II) | : 10 marks |
| Third Assessment | : 5 marks |
| End Semester Examination | : 75 marks |

The break-up of continuous assessment and examination marks for Practical courses is as follows:

| | |
|---|---|
| First assessment (Test-I) | : 15 marks |
| Second assessment (Test-II) | : 15 marks |
| Maintenance of record book | : 10 marks |
| End Semester Examination | : 60 marks |

The continuous assessment marks for the seminar / industrial training will be 40 and to be assessed by a seminar committee consisting of the Seminar Coordinator and a minimum of two members nominated by the Head of the Department. The continuous assessment marks will be awarded at the end of seminar session. 60 marks are allotted for the seminar / industrial training and viva voce examination conducted based on the seminar / industrial training report at the end of the semester.

The continuous assessment marks for the project work will be 40 and to be assessed by a review committee consisting of the project guide and a minimum of two members nominated by the Head of the Department. One of the committee members will be nominated as the Chairman by the Head of the Department. The Head of the Department may be a member or the Chairman. At least two reviews should be conducted during the semester by the review committee. The student shall make presentation on the progress made before the committee. 60 marks are allotted for the project work and viva voce examination at the end of the semester.

**15. Substitute Assessment**

A student who has missed, for genuine reasons accepted by the Head of the Department, one or more of the assessments of a course other than the final examination, may take a substitute assessment for any one of the missed assessments. The substitute assessment must be completed before the date of the third meeting of the respective class committees.

A student who wishes to have a substitute assessment for a missed assessment must apply to the Dean / Head of the Department within a week from the date of the missed assessment.

**16. Student Counselors (Mentors)**

To help the students in planning their course of study and for general advice on the academic programme, the Dean / Head of the Department will attach a certain number of students to a member of the faculty who shall function as student counselor for those students throughout their period of study. Such student counselors shall advise the students, give preliminary approval for the courses to be taken by the students during each semester and obtain the final approval of the Dean / Head of the Department.

**17. Class Committee**

For all the branches of study during the first two semesters, a common class committee will be constituted by the Dean of the faculty. From among the various teachers teaching the same common course to different classes during each semester of the first year, the Dean shall appoint one of them as course coordinator. The composition of the class committee during first and second semesters will be as follows:

- Course coordinators of all courses.
- All Heads of the Sections, among whom one may be nominated as Chairman by the Dean.
- The Dean may opt to be a member or the Chairman.

For each of the higher semesters, separate class committees will be constituted by the respective Head of the Departments. The composition of the class committees from third to eighth semester will be as follows:

- Teachers of the individual courses.
- A seminar coordinator (for seventh semester only) shall be appointed by the Head of the Department
- A project coordinator (for eighth semester only) shall be appointed by the Head of the Department from among the project supervisors.
- One Professor or Associate Professor, preferably not teaching theconcerned class, appointed as Chairman by the Head of the Department.
- The Head of the Department may opt to be a member or the Chairman.

The class committee shall meet three times during the semester. The first meeting will be held within two weeks from the date of class commencement in which the type of

assessment like test, assignment etc. for the third assessment and the dates of completion of the assessments will be decided.

The second meeting will be held within a week after the completion of the first assessment to review the performance and for follow-up action.

The third meeting will be held after all the assessments but before the University semester examinations are completed for all the courses, and at least one week before the commencement of the examinations. During this meeting the assessment on a maximum of 25 marks for theory / 40 marks for seminar / industrial training, practical and project work will be finalized for every student and tabulated and submitted to the Head of the Department (to the Dean in the case of I & II Semester) for approval and transmission to the Controller of Examinations.

**18. Attendance requirements**

The students with 75% attendance and above are permitted to appear for the University examinations. However, the Vice Chancellor may give a rebate / concession not exceeding 10% in attendance for exceptional cases only on Medical Grounds.

**19. Temporary break of study**

A student is permitted to go on break of study for a maximum period of one year either as two breaks of one semester each or a single break of one year.

The student applies for break of study, the student shall apply to the Dean in advance, in any case, not later than the last date of the first assessment period. The application duly filled by the student shall be submitted through the Head of the Department. In the case of short term employment/ training/ internship, the application for break of study shall be approved and forwarded by the Head of the department concerned to the Dean.

However, the student must complete the entire programme within the maximum period of eight years.

**20. Procedure for withdrawing from the Examinations**

A student can withdraw from all the examinations of the semester only once during the entire programme on valid grounds accepted by the University. Such withdrawal from the examinations of a semester will be permitted only if the candidate applies for withdrawal at least 24 hours before the commencement of the last examination. The letter grade 'W' appears in the mark sheet for such candidates.

**21. Passing and declaration of examination results**

All assessments of all the courses on an absolute marks basis will be considered and passed by the respective results passing boards in accordance with the rules of the University. Thereafter, the Controller of examinations shall convert the marks for each course to the corresponding letter grade as follows, compute the Grade Point Average (GPA) and

Cumulative Grade Point Average (CGPA), and prepare the mark sheets.

| | | |
|---|---|---|
| 90 to 100 marks | : | Grade 'S' |
| 80 to 89 marks | : | Grade 'A' |
| 70 to 79 marks | : | Grade 'B' |
| 60 to 69 marks | : | Grade 'C' |
| 55 to 59 marks | : | Grade 'D' |
| 50 to 54 marks | : | Grade 'E' |
| Less than 50 marks | : | Grade 'RA' |
| Withdrawn from the examination | : | Grade 'W' |

A student who obtains less than 30 / 24 marks out of 75 / 60 in the theory / practical examinations respectively or is absent for the examination will be awarded grade RA.

A student who earns a grade of S,A,B,C,D or E for a course is declared to have successfully completed that course. Such a course cannot be repeated by the student.

A student who is detained for lack of attendance must re-register for and repeat the courses in the respective semester.

A student who obtains letter grade RA / W in the mark sheet must reappear for the examination of the courses.

The following grade points are associated with each letter grade for calculating the grade point average and cumulative grade point average.

S - 10; A - 9; B - 8; C - 7; D - 6; E - 5; RA - 0

Courses with grade RA / W are not considered for calculation of grade point average or cumulative grade point average.

A student can apply for re-totaling of one or more of his examination answer papers within a week from the date of issue of mark sheet to the student on payment of the prescribed fee per paper. The application must be made to the Controller of Examinations with the recommendation of the Head of the Department.

After the results are declared, mark sheets will be issued to the students. The mark sheet will contain the list of courses registered during the semester, the grades scored and the grade point average for the semester.

GPA is the sum of the products of the number of credits of a course with the grade point scored in that course, taken over all the courses for the semester, divided by the sum of the number of credits for all courses taken in that semester.

CGPA is similarly calculated considering all the courses taken from the time of admission.

**22. Awarding degree**

After successful completion of the programme, the degree will be awarded with the following classification based on CGPA.

- For **First Class with Distinction**, the student must earn a minimum of 176 credits within four years (135 credits within three years for lateral entry students) for from the time of admission , pass all the courses in the first attempt and obtain a CGPA of 8.25 or above for all the subjects from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).
- For **First Class**, the student must earn a minimum of 176 credits within five years (135 credits within four years for lateral entry students) from the time of admission and obtain a CGPA of 6.75 or above for all the subjects from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students)..
- For **Second Class**, the student must earn a minimum of 176 credits within eight years (135 credits within seven years for lateral entry students) from the time of admission.

**23. Ranking of Candidates**

The candidates who are eligible to get the B.E. degree in the First Class with Distinction will be ranked together on the basis of CGPA for all the subjects of study from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students).

The Candidates passing with First Class will be ranked next after those with distinction on the basis of CGPA for all the subjects of study from I Semester to VIII Semester (III Semester to VIII Semester for lateral entry students). The ranking of candidates will be done separately for each branch of study.

**24. Transitory Regulations**

The University shall have powers to revise or change or amend the regulations, the scheme of examinations, the courses of study and the syllabi from time to time.

Wherever there had been change of syllabi, examinations based on the existing syllabi will be conducted for three consecutive times after implementation of the new syllabi in order to enable the students to clear the arrears. Beyond that the students will have to take up their examinations in equivalent courses, as per the new syllabi, on the recommendations of the Head of the Department concerned.

**Annexure-1**

## Diploma Programmes Eligible for the B.E (Lateral Entry) Programmes offered in FEAT (from 2017-2018)

| Sl.No. | Branches of Study | Eligible Diploma Programme (FT / PT / SW) |
|---|---|---|
| 1 | **Civil Engineering** | i. Civil Engineering<br>ii. Civil Engineering(Architecture)<br>iii. Environmental Engineering and Pollution Control(Full Time)<br>iv. Architectural Assistantship<br>v. Civil Engineering (Rural Tech.)<br>vi. Civil and Rural Engineering |
| 2 | **Civil and Structural Engineering.** | |
| 3 | **Mechanical Engineering** | i. Mechanical Engineering<br>ii. Mechanical and Rural Engineering<br>iii. Mechanical Design and Drafting<br>iv. Production Engineering<br>v. Production Technology<br>vi. Automobile Engineering<br>vii. Automobile Technology<br>viii. Metallurgy<br>ix. Mechatronics Engineering<br>x. Machine Tool Maintenance and Repairs<br>xi. Tool and Die making<br>xii. Tool Engineering<br>xiii. Tool Design<br>xiv. Foundry Technology<br>xv. Refrigeration and Air Conditioning<br>xvi. Agricultural Engineering<br>xvii. Agricultural Technology<br>xviii. Marine Engineering<br>xix. Mechanical Engineering(Production)<br>xx. Mechanical Engineering(Tool &Die)<br>xxi. Mechanical Engineering (Foundry)<br>xxii. Mechanical Engineering(R & A.C.)<br>xxiii. Electronics(Robotics)<br>xxiv. Mining Engineering<br>xxv. Agricultural Engineering and Farm<br>xxvi. Equipment Technology |
| 4 | **Mechanical Engineering (Manufacturing Engineering)** | |

| | | |
|---|---|---|
| 5 | **Electrical and Electronics Engineering** | i. Electrical and Electronics Engineering<br>ii. Electronics and Communication Engg.<br>iii. Electronics and Instrumentation Engg<br>iv. Electronics Engineering (Instrumentation)<br>v. Instrument Technology<br>vi. Instrumentation and Control Engineering<br>vii. Electrical Engineering (Instruments and Control)<br>viii. Electrical Engineering<br>ix. Instrumentation Technology<br>x. Electronics (Robotics)<br>xi. Mechatronics Engineering |
| 6 | **Electronics and Instrumentation Engineering** | |
| 7 | **Chemical Engineering** | i. Petrochemical Engineering<br>ii. Chemical Engineering<br>iii. Environmental Engineering and Pollution Control<br>iv. Leather Technology (Footwear)<br>v. Leather Technology<br>vi. Plastic Technology<br>vii. Polymer Technology<br>viii. Sugar Technology<br>ix. Textile Technology<br>x. Chemical Technology<br>xi. Ceramic Technology<br>xii. Petro Chemical Technology<br>xiii. Pulp & Paper Technology<br>xiv. Petroleum Engineering |
| 8 | **Computer Science and Engineering** | i. Electronics and Communication Engineering<br>ii. Computer Technology<br>iii. Computer Science and Engineering<br>iv. Information Technology<br>v. Computer Engineering<br>vi. Computer Networking<br>vii. Electronics(Robotics)<br>viii. Mechatronics Engineering |
| 9 | **Information Technology** | |
| 10 | **Electronics and Communication Engineering** | |

**FT- Full Time; PT-Part Time; SW- Sandwich**

# COURSES AND CREDITS - SUMMARY

| Semester | No. of Courses | | HS | BS | ES | PC | PE | OE | S&IT | Proj. | Total Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | T+P | Total | | | | | | | | | |
| I | 4+2 | **6** | 3*<br>1** | 9<br>3 | 5<br>2 | - | - | - | - | - | 17 |
| II | 4+4 | **8** | 4<br>1 | 13<br>5 | 7<br>2 | - | - | - | - | - | 24 |
| III | 6+2 | **8** | 3<br>1 | 4<br>1 | 8<br>3 | 8<br>3 | - | - | - | - | 23 |
| IV | 6+2 | **8** | - | 4<br>1 | 3<br>1 | 16<br>6 | - | - | - | - | 23 |
| V | 6+3 | **9** | - | - | - | 17<br>6 | 8<br>3 | - | - | - | 25 |
| VI | 6+3 | **9** | - | - | - | 10<br>4 | 11<br>4 | 3<br>1 | - | - | 24 |
| VII | 5+3 | **8** | 3<br>1 | - | - | 5<br>2 | 8<br>3 | 3<br>1 | 1<br>1 | - | 20 |
| VIII | 2+1 | **3** | - | - | - | - | - | 6<br>2 | -<br>- | 14<br>1 | 20 |
| **Total Courses** | 39+20 | **59** | **4** | **10** | **8** | **21** | **10** | **4** | **1** | **1** | - |
| **Total credits** | | - | **13** | **30** | **23** | **56** | **27** | **12** | **1** | **14** | **176** |

* - No of Credits ** - No of Courses

# DETAILS OF COURSE CODE

| Code (First Two digits ) | Details |
|---|---|
| 00 | Common course for the faculty |
| 01 | Civil Engg. Course |
| 02 | Civil and Structural Engg. course |
| 03 | Mechanical Engg. Course |
| 04 | Mechanical Engg (Manufacturing). Course |
| 05 | Electrical and Electronics Engg. Course |
| 06 | Electronics and Instrumentation Engg. course |
| 07 | Chemical Engg. course |
| 08 | Computer Science and Engg. course |
| 09 | Information Technology course |
| 10 | Electronics and Communication Engg. course |
| XX | Code of the programme concerned (01 to 10) |
| | |

| Code (3rd and 4th Digits) | Details |
|---|---|
| HS | Humanities Theory |
| HP | Humanities Practical |
| BS | Basic Science Theory |
| BP | Basic Science Practical |
| ES | Engineering Science Theory |
| SP | Engineering Science Practical |
| PC | Professional Core Theory |
| CP | Professional Core Practical |
| PE | Professional Elective Theory |
| EP | Professional Elective Practical |
| ST | Seminar / Industrial Training |
| OE | Open Elective Theory |
| PV | Project and Viva-voce |

5th digit represents the semester and 6th and 7th digits represent the serial number of courses

## DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING
# Curriculum for B.E.(Computer Science and Engineering)

### FIRST SEMESTER

| Sl. No. | Category | Course Code | Course | L | T | P/D | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | HS-I | 00HS101 | Technical English | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | BS-I | 00BS102 | Engineering Mathematics I | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | BS-II | 00BS103 | Applied Physics I | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | BS-III | 00BS104 | Applied Chemistry I | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | ES-I Lab | 00SP105 | Computer Programming Laboratory | - | 1 | 3 | 60 | 40 | 100 | 3 |
| 6 | ES-II Lab | 00SP106 | Engineering Graphics | - | 2 | 3 | 60 | 40 | 100 | 4 |
| | | | **Total** | **16** | **3** | **6** | **420** | **180** | **600** | **19** |

**L**-Lecture; **T**-Tutorial; **P**-Practical; **D**-Drawing
**Exam**-End Semester Examination; **CA**-Continuous Assessment

### SECOND SEMESTER

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | BS-IV | 00BS201 | Engineering Mathematics II | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | BS-V | 00BS202 | Applied Physics II | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | BS-VI | 00BS203 | Applied Chemistry II | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | ES-I | 00ES204 | Basic Engineering* | 4 | | - | 75 | 25 | 100 | 3 |
| 5 | HS-II | 00HP205 | Communication Skills and Language Laboratory | - | 2 | 3 | 60 | 40 | 100 | 4 |
| 6 | BS-I Lab | 00BP206 | Applied Physics Laboratory | - | - | 3 | 60 | 40 | 100 | 2 |
| 7 | BS-II Lab | 00BP207 | Applied Chemistry Laboratory | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | ES-III Lab | 00SP208 | Engineering Workshop | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **16** | **2** | **12** | **540** | **260** | **800** | **22** |

* **Basic Civil Engg. Course** for Mech., Manuf., EEE, EIE, ECE, CSE and IT
**Basic Electrical Engg. Course** for Civil, Civil and Structural, Mech., Manuf.,and Chem. Engg.
**Basic Mechanical Engg. Course** for Civil, Civil and Structural, EEE, EIE, ECE, CSE, IT and Chem. Engg.

| Semester – III | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **Sl. No.** | **Category** | **Course Code** | **Course** | **L** | **T** | **P** | **Exam** | **CA** | **Total** | **Credits** |
| 1 | HS-III | 00HS301 | Environmental Studies | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | BS-VII | 00BS302 | Engineering Mathematics III | 4 | 1 | - | 75 | 25 | 100 | 4 |
| 3 | ES-II | 00ES303 | Engineering Mechanics | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | ES-III | 08ES304 | Basic Electronics Engineering | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PC-I | 08PC305 | Microprocessors | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | PC-II | 08PC306 | Data Structures and Algorithms | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | ES-IV Lab | 08SP307 | Basic Electronics Engg. Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-I Lab | 08CP308 | Microprocessor Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **1** | **6** | **570** | **230** | **800** | **23** |

| **Sl. No.** | **Category** | Course Code | **Course** | **L** | **T** | **P** | **Exam** | **CA** | **Total** | **Credits** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semester - IV** | | | | | | | | | | |
| 1 | BS-VIII | 08BS401 | Discrete Mathematics | 4 | 1 | - | 75 | 25 | 100 | 4 |
| 2 | ES-IV | 08ES402 | Materials Science | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | PC-III | 08PC403 | Database Management System | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | PC-IV | 08PC404 | Computer Architecture | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PC-V | 08PC405 | Object Oriented Programming and C++ | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | PC-VI | 08PC406 | Operating Systems | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | PC-II Lab | 08CP407 | Data Structures and Algorithms Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-III Lab | 08CP408 | Database Management System Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **1** | **6** | **570** | **230** | **800** | **23** |

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semester - V** | | | | | | | | | | |
| 1 | PC-VII | 08PC501 | Theory of Computation | 4 | 1 | - | 75 | 25 | 100 | 4 |
| 2 | PC-VIII | 08PC502 | Computer Graphics and Multimedia | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | PC-IX | 08PC503 | Software Engineering | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | PC-X | 08PC504 | Computer Networks | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PE-I | 08PE505 | Professional Elective - I | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | PE-II | 08PE506 | Professional Elective - II | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | PC-IV Lab | 08CP507 | Operating Systems Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-V Lab | 08CP508 | Computer Graphics and Multimedia Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 9 | PE-I Lab | 08EP509 | Professional Elective Lab - I | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **1** | **9** | **630** | **270** | **900** | **25** |

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|
| **Semester - VI** | | | | | | | | | | |
| 1 | PC-XI | 08PC601 | System Software and Compiler Design | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | PC-XII | 08PC602 | Python Programming | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | PE-III | 08PE603 | Professional Elective – III | 4 | - | - | 75 | 25 | 100 | 3 |
| 4 | PE-IV | 08PE604 | Professional Elective - IV | 4 | - | - | 75 | 25 | 100 | 3 |
| 5 | PE-V | 08PE605 | Professional Elective - V | 4 | - | - | 75 | 25 | 100 | 3 |
| 6 | OE-I | XXOE606 * | Open Elective - I | 4 | - | - | 75 | 25 | 100 | 3 |
| 7 | PC-VI Lab | 08CP607 | Compiler Design and Network Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 8 | PC-VII Lab | 08CP608 | Python Programming Lab | - | - | 3 | 60 | 40 | 100 | 2 |
| 9 | PE-II Lab | 08EP609 | Professional Elective – Lab - II | - | - | 3 | 60 | 40 | 100 | 2 |
| | | | **Total** | **24** | **-** | **9** | **630** | **270** | **900** | **24** |

*First two digits indicate the code of the Department / branch offering the elective course.

| Sl. No. | Category | Course Code | Course | L | T | P | S | Exam | CA | Total | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Semester - VII** | | | | | | | | | | | |
| **1** | HS-IV | 00HS701 | Engineering Ethics | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 2 | PC-XIII | 08PC702 | Soft Computing Techniques | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 3 | PE-VI | 08PE703 | Professional Elective - VI | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 4 | PE-VII | 08PE704 | Professional Elective - VII | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 5 | OE-II | XXOE705 | Open Elective- II | 4 | - | - | - | 75 | 25 | 100 | 3 |
| 6 | PC-VIII Lab | 08CP706 | Soft Computing Techniques Lab | - | | 3 | - | 60 | 40 | 100 | 2 |
| 7 | PE-III Lab | 08EP707 | Professional Elective Lab - III | - | - | 3 | - | 60 | 40 | 100 | 2 |
| 8 | S & IT | 08ST708 | Seminar / Industrial Training | - | - | - | 1 | 60 | 40 | 100 | 1 |
| | | | **Total** | **20** | **-** | **6** | **1** | **555** | **245** | **800** | **20** |

| Sl. No. | Category | Course Code | Course | L | T | P | Exam | CA | Total | credits |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Semester - VIII** | | | | | | | | | |
| 1 | OE-III | XXOE801 | Open Elective- III | 4 | - | - | 75 | 25 | 100 | 3 |
| 2 | OE-IV | XXOE802 | Open Elective- IV | 4 | - | - | 75 | 25 | 100 | 3 |
| 3 | Proj. | 08PV803 | Project Work and Viva-voce | - | - | 15 | 60 | 40 | 100 | 14 |
| | | | **Total** | **8** | | **15** | **210** | **90** | **300** | **20** |

## PE - PROFESSIONAL ELECTIVES

1. Web Design
2. Perl Programming
3. Visual Programming
4. Java Programming
5. Real Time Systems
6. Mobile Computing
7. Mobile App Development
8. Software Testing and Quality Assurance
9. Distributed Systems
10. Network Security
11. Pervasive Computing
12. Adhoc and Sensor Networks
13. Digital Image Processing
14. Digital Watermarking and Steganography
15. Digital Signal Processing
16. Cloud Computing
17. Pattern Classification
18. Artificial Intelligence and Fuzzy Systems
19. Data Mining
20. Unix Programming
21. Natural Language Processing

## PE-LAB - PROFESSIONAL ELECTIVE LABS

1. Java and Web Design Lab
2. Perl Programming Lab
3. Visual Programming Lab
4. Mobile App Development Lab
5. Software Testing Lab
6. Distributed Systems Lab
7. Data Mining Lab
8. Unix Programming Lab
9. Natural Language Processing Lab

# OE - OPEN ELECTIVES

1. Enterprise Resource Planning
2. E-Commerce
3. Bioinformatics
4. Supply Chain Management
5. Cyber Forensics
6. System Modeling and Simulation
7. Data Analytics
8. Social Network Analysis
9. Organizational Behaviour and Management
10. Product Design
11. Embedded Systems
12. Knowledge Management
13. Project Management
14. Biology for Engineers
15. Disaster Management
16. Entrepreneurship
17. Human Rights
18. National Service Scheme

# SYLLABUS

## FIRST SEMESTER

| 00HS101 | TECHNICAL ENGLISH | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- English technical communication focuses on developing the proficiency of Engineering students in communicative skills, ensuring them to face the demand of their profession with high command in English.
- At the end of the course, the learners will be able to use English for all purposes of technical communication and come out in "flying colours".

**Unit - I : Listening Strategies**

This unit makes the students to get exposed to the listening exercises and get registered in their minds the nuances of listening and its importance.

1. Listening process.
2. Types of listening.
3. Barriers to listening.
4. Characteristics of good listeners.
5. Team listening and note making.

**Unit - II : Critical Reading and Creative Writing Skills**

This unit introduces communication model like courtesy, body language, role play and good presentation in an effective manner, where the students are given an opportunity to observe, analyze, interpret, imagine and implement their ideas too.

**Poem :** Road not taken – Robert Frost Ulysses – Alfred Lord Tennyson.

**Prose :** Of Studies – Francis Bacon
Science – Destroyer or creator – J. Bronowski

**Play :** Pygmalion – Bernardshaw.

**Unit - III : Speaking Skill**

Students shall be motivated to speak in English on familiar or unfamiliar topics. It is a platform to train the students to achieve competency in oral expression.

1. Interview Techniques
2. Group discussion
3. Making presentation and Discussing on the presentation.
4. Sample interviews
5. Dialogue writing

**Unit - IV : Professional Writing**

Students shall be trained to create their own proficiency in writing like - calling for quotation, asking clarification, placing orders and so on.

1. Poster making
2. Letter writing (formal and E-mail)
3. Analytical writing
4. Format of memos.
5. Report Writing

**Unit - V : Theoretical writing**

The nuances of English grammar may be taught to the students so as to present flawless English both in their oral and written communication

1. Vocabulary – Homonyms, Homophones, Acronyms & Abbreviations, Idioms & Phrases.
2. Single word substitution
3. Concord
4. Tag Questions
5. Active voice and passive voice

**Text Book:**

1. Rizvi, Ashraf.2006. *"Effective Technical Communication"*. New Delhi. Tata Mc.Graw Hill Publication Company Ltd.

**Reference books:**

1. Raman, Meenakshi and Sangeetha Sharma.2004. *"Technical Communication: Principles and Practice"*. New Delhi: OUP.
2. Bailey, Stephen. "*Academic Writing: A practical guide for students*". New York: Rutledge.2011.
3. Gerson, Sharon J and Steven M. Gerson. 2007. "*Technical writing: Process and Product*". Delhi: Pearson prentice Hallan, 1980.

**Course Outcomes:**

At the end of this course, students will able to

1. Acquire an understanding of the techniques of listening.
2. Understanding the importance of comprehension skills.
3. Ensure the students to achieve competency in oral expression.
4. Understand the characteristics of formal writing and become familiar with the structure and layout of professional writing.
5. Able to present flawless English both in oral & written communication.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | - | - | - | - | - | - | - | - | - | 2 | - | - |
| **CO2** | - | - | - | - | - | - | - | - | - | 3 | - | - |
| **CO3** | - | - | - | - | - | - | - | - | 2 | 2 | - | - |
| **CO4** | - | - | - | - | - | - | - | - | 3 | 2 | - | - |
| **CO5** | - | - | - | - | - | - | - | - | - | 3 | - | - |

| 00BS102 | ENGINEERING MATHEMATICS - I | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

To acquaint the student with the concepts in

- matrices,
- differential calculus,
- multiple integrals,
- vector calculus, which are most important in connection with practical engineering problems.

**Unit I: Matrices**

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem – Orthogonal transformation of a real symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation.

**Unit II: Differential Calculus**

Curvature in Cartesian and parametric co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes.

**Unit III: Differential Calculus: Functions of Several Variables**

Jacobians – Taylor's and Maclaurin's series expansions of functions of two variables – Maxima and Minima of functions of two variables – Constrained Maxima and Minima by Lagrange Method.

**Unit IV: Multiple Integrals**

Double integration – Cartesian and polar co-ordinates – change of order of integration – area as a double integral – triple integration – Volume as a triple integral.

**Unit V: Laplace Transform**

Definition, Transform of elementary functions, Properties, Derivatives and integrals of transforms, Transforms of derivatives, Convolution theorem, Transforms of periodic functions, Inverse Laplace transform, Application to solution of linear ordinary differential equations of second order with constant coefficients.

**(In all units, proof of theorems are not included)**

**Text books:**

1. Venkataraman M K, Engineering Mathematics, Volumes I (2008) and II (2009), The National Publishing Company, Chennai.
2. Veerarajan T, Engineering Mathematics, Second Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2011.

**Reference Books:**

1. Grewal B S, Higher Engineering Mathematics, Khanna Publishers, Delhi, 40th Edition, 2007.
2. Erwin Kreysig, Advenced Engineering Mathematics, John Wiley & Sons, 8th Edition, 2002.

**Course Outcomes:**

At the end of this course, students will able to

1. Solve eigen values and eigen vectors of a real matrix and Orthogonal transformation of a matrix.

2. Analyze the curvesby finding its curvature and evolutes.
3. Understand the extreme values for functions of two variables.
4. Evaluate double and triple integrals.
5. Apply Laplace transform in solving differential equations.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 2 | 2 | 2 | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |

| **00BS103** | **APPLIED PHYSICS – I** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **4** | **0** | **0** |

**Course Objectives:**

At the end of the course the students would be exposed to fundamental knowledge in various engineering subjects and applications

- Determine the different modulus of elasticity and viscosity of the less and highly viscous liquids.
- Design of acoustically good buildings.
- Interferometric techniques in metrology, communication and civil engineering.
- Application of quantum physics to optical and electrical phenomena.
- Application of ultrasonics and acoustics.
- Structure identification of engineering materials.
- Applications of Radio isotopes and power reactor systems.

**Unit - I : Properties of Matter**

Introduction to elasticity - Hook's law - Different moduli of elasticity - Bending of beams – Determination of Young's modulus by Uniform and Nonuniform bending – I-shapegirder – Torsional pendulum - Theory – Experiment and its applications. Introduction to Viscosity – streamline and turbulent flow – Poiseuille's equation- capillary flow method – Stoke's law – terminal velocity – determination of viscosity by Stoke's method.

**Unit -II : Sound**

Introduction to Acoustics - factors affecting acoustics of buildings and their remedies– absorption coefficient– Sabine's formula for reverberation time.

Introduction to Ultrasonics – production – magnetostriction and piezo electric methods – Detection of Ultrasonic waves (Acoustics grating) – Applications.

**Unit – III : Optics**

Interference – Air wedge – Michelson's interferometer – Diffraction - Dispersive power of prism and grating – Polarisation – Types of Polarisation - theory of plane, Circularly and elliptically polarized light – photo elasticity -Stress optic law – Effect of a stressed model in plane polariscope – Isoclinic and Isochromatic fringes – photo elastic bench – uses.

**Unit – IV : Crystal Physics**

Lattice - Unit cell - Bravais lattice - Atomic radius, co-ordination number, Packing factor and their calculations of SC,BCC,FCC and HCP crystal structures - Miller indices - Crystal imperfections (Point defect, Line defect, surface defect and volume defect).

**Unit –V: Nuclear Physics**

Introduction - General properties of Nucleus – Mass defect, Binding energy, Nuclear models- Liquid drop model and Nuclear shell model - Nuclear detector – G.M counter – Scintillation Counter – Ionisation Chamber – Fission, Fusion, Thermonuclear reaction and Stellar energy – Nuclear reactor – General nuclear reactor – Breeder nuclear reactor.

**Text Books:**

1. Arumugam M., "Engineering Phyisics", Anuradha Agencies, Kumbakonam, 2000.
2. Gaur R.K. and Gupta S.L., "Engineering Physics", DhanpatRai Publishers, New Delhi, 2003.

**Reference Books:**

1. Pillai S.O., "Solid State Physics", New Age International Publication, New Delhi, Seventh Edition, 2015
2. Palanisamy P.K. "Physics for Engineers", Scitech Publication (India) Pvt. Ltd., Chennai, Second Edition, 2005.
3. Mani. P. "Engineering Phyisics", Dhanam Publication, Chennai, 2011.
4. Rajendran V. and Marikani A., "Applied physics for engineers", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2004.
5. Theraja B.L, "Modern Physics", Chand & company Ltd. , Edition 1990.
6. Tayal D.G., "Nuclear Physics", Himalaya publishing house, 2007.
7. Ghoshal.S.N., "Nuclear Physics", S. Chand & Company Ltd., 2012.
8. Avadhanulu M.N. and Kshirsagar P.G., "A Text Book of Engineering Physics", S. Chand & Company Ltd., 7th Enlarged Revised Ed., 2005.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Describe the concept Hook's law of elasticity and its application towards I shaped grider.
2. Develop innovative methods of construction noise free halls.
3. Understand the different properties of light waves.
4. Gain knowledge on the importance of packing factor in crystal structure.
5. Analyze the different nuclear models and nuclear detector.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | 2 | - | 3 | 2 | - | - | - | - | - | 1 |
| **CO2** | 3 | 2 | - | - | 2 | 1 | 1 | 1 | - | - | - | - |
| **CO3** | 3 | - | 1 | - | - | - | 1 | 1 | - | - | - | - |
| **CO4** | 2 | 1 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | - | - | - | 1 | 1 | - | - | - | 1 | - | 1 |

| 00BS104 | APPLIED CHEMISTRY – I | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**COURSE OBJECTIVES:**

To make the student conversant with the

- Water treatment techniques and disinfection methods.
- Working principle of electrochemical cells.
- Sources, refining and various types of fuels.
- Mechanism, classification, applications of lubricants and introduction adhesives.
- Surface chemistry, principle and applications of chromatography.

**Unit I :WATER TREATMENT**

Water – Hardness of water – softening of water by ion-exchange process and zeolite process – boiler feed water – specifications – boiler troubles (Sludge and scale formation, priming and foaming, caustic embrittlement and boiler corrosion) – removal of dissolved $CO_2$, $O_2$ and acids – internal treatment of boiler feed water (colloidal, carbonate, phosphate, calgon and EDTA conditioning) – disinfection of water – break point chlorination – desalination of brackish water by reverse osmosis method - Determination of total hardness by EDTA method.

**Unit II :ELECTROCHEMISTRTY**

Electrochemical cell – EMF – determination of EMF of electrochemical cell – single electrode potential – standard electrode potential – Nernst equation – reference electrodes – standard hydrogen electrode, calomel electrode, glass electrode – electrochemical series – concentration cell.

**Unit III :FUELS AND COMBUSTION**

Classification of fuels – calorific value – HCV and LCV – Analysis of coal – proximate and ultimate analysis – carbonization of coal (HTC and LTC) – Manufacture of coke – properties of coke – flue gas analysis by Orsat's apparatus. Petroleum – Refining – Synthetic petrol – Fischer – Tropsch and Bergius process – cracking – polymerization process – knocking in petrol and diesel engines – octane number and cetane number – properties of straight run, cracked and polymer gasoline.

**Unit IV :ENGINEERING MATERIALS – I**

Lubricants and their functions – Mechanisms of lubrication – classification of lubricants with example – lubricating oils – properties of lubricating oils (viscosity index, flash and fire points, cloud and pour points, oiliness, carbon residue and aniline point) – Solid lubricants – Greases – emulsion lubricants. Adhesives – Definition – adhesive action – development of adhesives strength – physical and chemical factors influencing adhesive action – bonding process of adhesives – adhesives for building and constructions – animal glues, casein glues.

**Unit V :ANALYTICAL TECHNIQUE AND SURFACE CHEMSITRY**

Chromatography – Definition – classifications – partition chromatography and adsorption chromatography. Surfacechemistry – Definition – types of adsorption – characteristics of adsorption – adsorption isotherms – Freundlich's adsorption isotherms and Langmuir's adsorption isotherms – applications of adsorption.

**Text Books:**

1. Sivasankar. B (2012)., '***Engineering Chemistry'***, Tata McGraw-Hill Publishing company Limited, NewDelhi.

2. Sivakumar. R and Sivakumar. N (2013)., '***Engineering Chemistry'***, Tata McGraw-Hill Company Limited, NewDelhi

**Reference Books**

1. Jain.P.C. and Monica Jain (2010)., '***Engineering Chemistry'***, DhanpatRai& Sons, New Delhi
2. Dara.S.S. and Umare.S.S (2014)., '***Text book of Engineering Chemistry***,' S.Chand& Co. Ltd., New Delhi.
3. Gopalan. R, Venkappayya. D, and Nagarajan. S (2008)., '***Engineering Chemistry'***, Tata McGraw Hill Publishing Company Limited, New Delhi.

**Course Outcomes:**

At the end of the course, the student will be able to

1. Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.
2. Apply the concepts of electrochemistry in electroplating and batteries.
3. Examine the properties and sources of fuels.
4. Categorize lubricants and adhesives according to their properties.
5. Predict chromatographic techniques and adsorption isotherms.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | - | - | - | 2 | 1 | - | - | - | - | - |
| **CO2** | 3 | 2 | 1 | - | 1 | 1 | - | - | - | - | - | - |
| **CO3** | 1 | 2 | 1 | 1 | 1 | 1 | 1 | - | - | - | - | - |
| **CO4** | 2 | - | - | 1 | - | 1 | - | - | - | - | - | - |
| **CO5** | 1 | 2 | 1 | - | 2 | 1 | 2 | - | - | - | - | - |

| **00SP105** | **COMPUTER PROGRAMMING LABORATORY** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **0** | **1** | **3** |

**Course Objectives:**

- To enable the students to have a good understanding about the concepts of "C" programming.
- To provide the hands on experience in basic concepts of AUTOCAD to students.

**C Programs based on the following concepts:**

Basic structure of C Programs – Constants – Variables - Data Types - – Keywords – Identifiers - Operators - Expressions – IF, IF-ELSE, Nested IF-ELSE, Switch, WHILE, DO, FOR and GOTO statements - Arrays: one dimensional and two dimensional – Strings - Functions.

**AUTOCAD:**

Introduction – Terminology – Coordinates - Operations – Control keys – Commands – Utility Commands –File Commands – Edit and Inquiry Commands – Display Control Commands – Modes – Layers – Colors – Blocks. Special Features – Dimensioning – Angular, Diameter and Radius – Hatching – Patterns – Slides – Attributes – Configuring – Plotting– Exercises in AUTOCAD (2D Drawings only)

**Text Books:**

1. E. Balagurusamy, Programming in Ansi C, Tata McGraw-Hill Education, (2012) 6th Edition.
2. Cheryl R. Shrock, AutoCAD Pocket Reference, BPB Publications,(2015)

**Reference Books**

1. Yashavant P. Kanetkar, Let us C, BPB Publications, 14th Edition, (2016)
2. David Byrnes, AutoCAD 2010 FOR DUMMIES, Wiley Publishing,Inc., (2010)

**Course Outcomes:**

At the end of this course, the students will be able to

1. Analyze program requirements and develop programs using conditional and looping statements.
2. Develop programs for handling arrays and strings.
3. Create programs with user defined functions.
4. Study and Practice the basic drawing and editing commands of AUTOCAD for creating 2D drawings.
5. Apply basic drawing and editing commands of AUTOCAD for 2D drawing including dimensioning, hatching, sliding and pattern creation.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 2 | 3 | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 3 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | 2 | 3 | - | 1 | - | - | - | - | - | - | - |
| **CO4** | 1 | 1 | 1 | - | 2 | - | - | - | - | - | - | - |
| **CO5** | 1 | 1 | 1 | - | 2 | - | - | - | - | - | - | - |

| **00SP106** | **ENGINEERING GRAPHICS** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **2** | **0** | **3** |

**Course Objectives:**

- To develop the ability to produce simple engineering drawing and sketches based on current practice.
- To develop the means for communication of ideas, thoughts and design of objects, related to engineering applications, to others though drawing.
- To develop the skills to read manufacturing and construction drawings used in industry.
- To develop a working knowledge of the layout of plant and equipment.
- To develop skills in abstracting information from calculation sheets and schematic diagrams to produce working drawings for manufacturers, installers and fabricators.
- To expose the international standards of technical drawing.

**UNIT – I**

Introduction to Engineering Drawing, Use of drafting instruments– Lettering and dimensioning. Construction of conic sections -Ellipse, Parabola & Hyperbola (Eccentricity Method, Rectangle

method, Intersecting arcs method) - Special curves- Simple cycloids and involutes– Tangent and normal at points on the curves only.

**UNIT – II**

Orthographic projections - Projections of Points- Projections of Straight lines (given the projections, to determine the true length and true inclinations).

**UNIT – III**

Projections of Solids like prism, pyramid, cylinder, cone, tetrahedron and octahedron in simple positions.

Auxiliary Projections of prism, pyramid, cylinder, cone when the axis is inclined to one plane only.

**UNIT – IV**

Sections of prism, pyramid, cylinder, cone in simple position – true shape of sections. Intersection of surfaces - cylinder to cylinder and cylinder to cone with axis intersecting at right angles. Development of lateral surfaces of prism, pyramid, cylinder, cone and cut solids.

**UNIT – V**

Isometric Projections of simple solids and combinations. Perspective Projections of simple solids. Conversion of Pictorial view of simple objects into Orthographic views

**Text Books:**

1. Bhatt, N.D Engineering Drawing -Charotar Bookstall, Anand – 388001.
2. Venugopal, K Engineering Drawing and graphics – New age international (P) Ltd., Publishers, Chennai.

**Reference Books:**

1. Gopalakrishna, K.R. Engineering Drawing Vol.I and Vol. II – Subhas stores, Avenue Road, Bangalore – 560002.
2. Kumar, M.S Engineering Graphics – DD Publications, Chennai – 6400048.

**Course Outcomes:**

At the end of this course, the students will be able to:

1. Utilize drawing instruments effectively and present engineering drawings and sketches
2. Construct basic and intermediate geometries.
3. Understand the concept of orthographic, isometric projections of points, lines and regular solids, component drawing, building drawing.
4. Acquire visualization skills to develop new products.
5. Develop their technical communication skills and promote life-long learning.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | 3 | - | 1 | - | - | - | - | 2 | - | - |
| **CO2** | - | 2 | 3 | 2 | 2 | - | - | - | - | 2 | - | - |
| **CO3** | 3 | 2 | 3 | 2 | 1 | 2 | - | - | - | 2 | - | - |
| **CO4** | - | 2 | - | - | - | 3 | - | - | - | - | - | 2 |
| **CO5** | - | - | - | 1 | - | - | - | - | - | 3 | - | 3 |

## SECOND SEMESTER

| 00BS201 | ENGINEERING MATHEMATICS II | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To acquaint the student with the concepts in ordinary differential equations and vector calculus.
- To acquaint the student with the techniques in the theory of analytic functions and complex integration.
- Above topics are most important in connection with practical engineering problems.

**Unit I : Ordinary Differential Equations**

Second order linear differential equations with constant coefficients, Second order linear differential equations with variable coefficients (Euler and Legendre's linear equations), Simultaneous first order linear equations with constant coefficients, method of variation of parameters.

**Unit II : Vector Differentiation**

Gradient, divergence and curl, directional derivative, unit normal vector, irrotational and solenoidal vector fields, expansion formulae for operators involving $\nabla$.

**Unit III: Vector Integration**

Line, surface and volume integrals, Green's theorem in a plane, Gauss divergence theorem, Stoke's theorem – Verification of the above theorems and evaluation of integrals using them.

**Unit IV: Analytic Functions**

Functions of a complex variable, Analytic function, the necessary conditions (Cauchy-Riemann equations), sufficient conditions, Properties of analytic functions, harmonic functions, construction of Analytic function by Milne-Thomson method, Conformal mapping: $w = z^2$, $1/z$, $e^z$, sin z, cos z.

**Unit V: Complex Integration**

Statement and application of Cauchy theorem, Cauchy integral formulas, Taylor and Laurent expansion, Singularities – Classification; Residues – Statement and application of Cauchy residue theorem, Contour integration round the unit circle.

**(In all units, proof of theorems are not included)**

**Text Books:**

1. Venkataraman M K, Engineering Mathematics, Volumes I (2008) and II (2009), The National Publishing Company, Chennai.
2. Veerarajan T, Engineering Mathematics, Second Edition, Tata McGraw Hill Education Private Limited, New Delhi, 2011.

**Reference Books**

1. Grewal B S, Higher Engineering Mathematics, Khanna Publishers, Delhi, 40th Edition, 2007.
2. Erwin Kreysig, Advanced Engineering Mathematics, John Wiley & Sons, 8th Edition, 2002.

**Course Outcomes**

At the end of this course, students will able to

1. Solve double and triple integrals in finding area and volumes.
2. Apply line, surface and volume integrals in Gauss, Greens and Stoke's theorems.
3. Solve Second order linear differential equations with constant coefficients.
4. Construct analytic function and analyze conformal mappings.
5. Evaluate the complex integrals and contour integration.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | 2 | - | | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - |

| **00BS202** | **APPLIED PHYSICS – II** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **4** | **0** | **0** |

**Course Objectives**

At the end of the course the students would be exposed to fundamental knowledge in various materials and applications

- Application of lasers and fiber optics in engineering and technology.
- Astrophysics is the study of physics of the universe. In various objects, such as stars, planets and galaxies.
- To measure positions, brightness, spectra structure of gas clouds, planets, starts, galaxies, globular clusters, quasars etc.
- Physics of modern engineering materials.
- Electromagnetic phenomena and wave propagation.
- Applications of nano materials, nano electronics and optoelectronic devices.
- Design of energy sources and applications of solar energy.

**Unit I: Laser and Fiber Optics**

Introduction to laser - Einstein co-efficients (A&B) – properties of Laser- Types of laser – $CO_2$, Nd-YAG and Semiconductor lasers - Applications – Holography - Construction and reconstruction of hologram - Applications.

Fiber optics - Principle and propagation of light in optical fibers - Numerical aperture and acceptance angle - Types of optical fibers (Material, Mode and refractive index) - Applications - Fiber Optic communication system.

**Unit II : Dielectrics and Superconductors**

Introduction to Dielectrics – Types of Dielectric materials - Dielectric constant – Determination of Dielectric constant ($\sum r$) by Schering Bridge method – Different types of polarization – Local or

Internal field – Clausius-Mosotti Equation – Dielectric Loss – Dielectric breakdown – Dielectric Properties and applications – Superconductivity – Properties – Meissner effect – Type I and Type II superconductors – BCS theory- High temperature Superconductors – Applications.

**Unit III : Nano Materials**

Introduction to Nanomaterials – properties – Types of nanomaterials – synthesis of nanomaterials - Top-down approaches – Mechanical grinding, Lithiography – Types of Lithiography - Bottomup approaches – physical vapour deposition method, Sol-gel method. Applications of nanomaterial. Carbon Nanotubes (CNT) – Introduction – Types of Carbon Nanotubes – Synthesis of Carbon Nanotubes – Properties and its application.

**Unit IV : Quantum Mechanics**

Heisenberg uncertainty Principle - Wave particle dual nature – De Broglie's matter Waves – wave Velocity and group velocity.

The wave Equation, Schrödinger's Time dependent wave equation, Schrödinger's time independent wave equation - The Wave function and its physical significance - The particle in a box – energy quantization – Eigen values and Eigen functions.

**Unit V :Energy Physics**

Introduction to energy source - Energy sources and their availability (Conventional &non-conventional energy sources) – Solar energy – Introduction – Methods of Harvesting Solar energy (Solar cells, Solar battery, Solar heat collectors and Solar water heater) - Wind energy – basic components of a WECS (Wind Energy Conversion System) – Classification of WEC Systems – Advantages and disadvantages of WECS - Biomass – Biomass conversion - Biogas Generation - Classification of Biogas plants.

**Text Books:**

1. Arumugam.M. "Engineering Physics", Anuradha agencies, 2nd Edition, 1997.
2. Gaur R.K. and Gupta S.L., "Engineering Physics", DhanpatRai Publishers, New Delhi, 2003.

**Reference Books:**

1. Rajendran.V, "Engineering Physics", Tata McGraw Hill publishers, 2009.
2. Rai G.D., "Non-conventional Energy sources", Khauna Publications, 1993.
3. Martin Harwit, "Astrophysical Concepts", Springer, 4th Edition, 2006.
4. Dimitri Mihalas. "Stellar Atmospheres", San Francisco, W.H, Freeman & Company, 1978.
5. Wilson M., Kannangara K., Smitt G., Simmons M. &Boguse B. "Nanotechnology", Basic science and emergine technology, Raguse Chapman hall Publications, 2002.
6. Kenneth Klabunde.J, "Nanoscale Materials in chemistry", A John Eiley& Sons, Inc., Publication, 2001.
7. Mani. P. "Engineering Phyisics", Dhanam Publication, Chennai, 2011.
8. Agarwal.M.P, "Solar Energy", S.Chand& Co., I Edn, New Delhi, 1983.
9. John Twidell& Tony Weir, " Renewable Energy Resources" , Taylor & Francis, 2005.
10. Carroll B.W. &D.A.Ostlie , "An introduction to Modern Astrophysics", 2nd Edition, 2011.
11. Avadhanulu M.N. and Kshirsagar P.G., "A Text Book of Engineering Physics", S. Chand & Company Ltd., 7th Enlarged Revised Ed., 2005.
12. Rai.G.D. *"Solar Energy* Utilization" Volume-1 & 2 by - Khanna Publishers, New Delhi.
13. Senthilkumar.G, Engineering Physics, VRB Publishers Pvt. Ltd., Chennai.

14. Ravikrishnan.A, Environmental Science and Engineering, Hitech Publishing Company Pvt.Ltd.
15. Rai.G.D. , *"Non-Conventional Energy Sources"* - Khanna Publishers.
16. Senthilnathan.S, Gnanapoongothai.T, Oudayakumar.K, Jayavarthanan.T, "Material Science", SSMP Publications.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Description of different types of lasers and fibers optical materials and its application.
2. Explain the diamagnetic properties of superconductor
3. Understand the different types of nanomaterials.
4. Evaluate the quantum mechanical concept of wave velocity and group velocity.
5. Compared the different energy resources and their availability.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | 2 | - | 3` | 2 | - | - | - | - | - | 1 |
| **CO2** | 3 | 2 | 2 | 2 | 2 | 1 | 1 | - | 2 | - | - | - |
| **CO3** | 3 | 2 | 1 | - | - | - | 1 | - | - | - | - | - |
| **CO4** | 3 | 1 | - | 2 | - | - | 1 | - | - | - | - | - |
| **CO5** | 3 | - | 2 | - | 1 | 2 | 1 | 1 | 3 | 1 | - | 1 |

| **00BS203** | **APPLIED CHEMISTRY II** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **4** | **0** | **0** |

**Course Objectives:**

To make the students to understand the

- Types of polymers and polymerization processes.
- Phase rule with different kinds of systems.
- Different types of corrosion and their mechanism.
- Working principle and applications of primary and secondary batteries.
- Engineering materials such as refractories and abrasives.

**Unit I: POLYMERS**

High polymers: plastics – Thermoplastics and thermosetting resins. Addition polymerization and condensation polymerization – compounding of plastics – Moulding methods – Compression, injection and blow moulding – Important engineering plastics – polyethylene, PVC, Teflon, Polystyrenes, Nylon 6,6, Bakelite, Polyurethane – Rubber – natural rubber – vulcanization of rubber – Synthetic rubber – buna-S, butyl rubber, neoprene and polyurethane foams.

**Unit II: PHASE RULE**

Phase rule – statements and explanation of the terms involved – condensed phase rule – construction of phase diagram – water system – sulphur system – phase rule for two component alloy systems – thermal analysis – eutectic system – Lead-Silver system – simple eutectic formation – Zinc – Magnesium alloy system.

**Unit III: CORROSION AND PREVENTION**

Corrosion: Dry and wet corrosion – Pilling-Bedworth rule – mechanism of wet corrosion – types of wet corrosion – galvanic corrosion – differential aeration corrosion – factors affecting corrosions. Corrosion control methods – design and material selection – cathodic protections – sacrificial anode and impressed current method – corrosion inhibitors – protective coatings – surface preparations – Galvanizations, Tinning – electroplating – anodizing, phosphate coating, hot dipping.

**Unit IV: ENERGY STORAGE DEVICES**

Types of battery – commercial voltaic cell – primary battery – secondary storage cell – lead – acid cell, nickel-cadmium cell, lithium battery – fuel cells – hydrogen-oxygen fuel cell – photovoltaic cell – principle, working and applications.

**Unit V: ENGINEERING MATERIALS II**

Refractories – classification (acidic, basic and neutral refractories) – properties (refractoriness, refractoriness under load, dimentional stability, porosity, thermal spalling) – fire clay bricks, alumina bricks and zirconia bricks. Abrasives – Moh's scale of hardness – natural abrasive (diamond, corundum, emery, garnets and quartz) – synthetic abrasives – silicon carbide, boron carbide and their uses.

**Text Books:**

1. Sivasankar. B (2012)., '***Engineering Chemistry'***, Tata McGraw-Hill Publishing company Limited, NewDelhi.
2. Sivakumar. R and Sivakumar. N (2013)., '***Engineering Chemistry'***, Tata McGraw-Hill Company Limited, NewDelhi.

**Reference Books:**

1. Jain.P.C. and Monica Jain (2010)., '***Engineering Chemistry'***, DhanpatRai& Sons,New Delhi
2. Dara.S.S. and Umare.S.S (2014)., '***Text book of Engineering Chemistry'***, S.Chand& Co. Ltd., New Delhi.
3. Gopalan. R, Venkappayya. D, and Nagarajan. S (2008)., '***Engineering Chemistry'***, Tata McGraw Hill Publishing Company Limited, New Delhi.
4. Gowariker.V.R.,Viswanathan N.V. and JayadevSreedhar, (2006)., '***Polymer Science'***, New Age International P (Ltd.,), Chennai. (Unit I)
5. Puri. B. R, Sharma. L. R &Pathania. M. S (2013)., '***Principles of Physical Chemistry'***, Vishal Publishing Company, NewDelhi. (Unit II)

**Course Outcomes:**

At the end of the course, the student will be able to

1. Illustrate the synthesis and applications of polymers and moulding processes.
2. Describe the concept of phase rule and its applications in alloy preparation.
3. Relate the concept of corrosion with the protection of metals from corrosion.
4. Examine about energy storage devices including solar cells.
5. Interpret the knowledge on classification, synthesis and applications of abrasives and refractories.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | 1 | - | 1 | 1 | 1 | - | - | - | - | 1 |
| **CO2** | 3 | - | 1 | 1 | 2 | 1 | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 1 | - | 1 | 2 | 1 | - | - | - | - | - |
| **CO4** | 3 | - | 2 | - | 2 | 1 | 2 | - | - | - | - | - |
| **CO5** | 3 | - | - | - | - | 1 | 1 | - | - | - | - | - |

| **00ES204** | **BASIC ENGINEERING (CIVIL)** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **2** | **0** | **0** |

**Course Objectives:**

- To inculcate a knowledge on essentials of Civil Engineering.
- To expose the students on the role, significance and contributions of Civil Engineering in satisfying societal needs.
- To illustrate the concepts of various construction techniques.

**Unit I**

Introduction to Civil Engineering - various disciplines of Civil Engineering, relevance of Civil Engineering in the overall infrastructural development of the country. Introduction to various building materials – Stone, Bricks, Steel, Cement, Concrete, Timber – its characteristics, types and uses. Various types of buildings as per nbc; Selection of suitable site for buildings, Components of a residential building – its functions, Orientation of a building, simple definitions - plinth area / built up area, floor area / carpet area – floor space index.

**Unit II**

Surveying - Principles and objectives of surveying; Types, Classifications of surveying, measurement of areas and distances – chain – compass: Introduction to Leveling, Total station, Remote sensing - fundamental principles and applications.

Building construction – foundations; Bearing capacity of soil, functions of foundations, Types - Shallow and Deep. Brick masonry – Header, Stretcher, Flemish and English Bond. Columns, Lintels, Roofs – functions, types, roofing materials, Floors – functions, types, flooring materials. Decorative finishes – plastering, interior design

**Unit III**

Bridges – necessity - selection of site – components of a bridge: Dams – types – selection site - forces acting on a dam – Roads – uses - classification of roads – components of a road; Railways – basic components of permanent way – water supply – per capita requirement – sources – need for conservation of water – rain water harvesting - basic water treatment – Sewage and its disposal – basic definitions – Septic tank - components and functions.

**Text Books:**

1. Ramesh babu. V, A text book of Basic Civil Engineering, Anuradha Agencies, Kumbakonam, 1995.

2. Palanichamy M.S., Basic Civil Engineering, Tata McGraw Hill Publishing Company ltd, 2000.

**Reference books:**

1. Ramamrutham V, Basic Civil Engineering, DhanpatRai Publishing Co. (P) Ltd., 1999.
2. Natarajan K V, Basic Civil Engineering, Dhanalakshmi Publications, Chennai, 2005.
3. SatheeshGopi, Basic Civil Engineering, Pearson Publications, 2010.

**Course Outcomes:**

1. Understand the basic knowledge on civil engineering materials.
2. Develops the skill to satisfy the social needs.
3. Describe the suitable method of construction technique.

| 00ES204 | BASIC ENGINEERING (ELECTRICAL) | L | T | P |
|---|---|---|---|---|
| | | 2 | 0 | 0 |

**Course Objectives:**

- To impart the basic principles of generation of electrical energy.
- To explain the operation of electrical machines and various measuring instruments.
- To understand the basic concepts of circuit analysis.
- To provide an overview of the principles, operation and application of semiconductor devices like diodes, BJT, FET and a basic knowledge of fundamentals of Communication Systems.

**Unit I**

Sources of Electrical energy–Generation of electrical energy – working principles of DC generators and alternators– Advantages of electrical energy over other forms of Energy. Operating principle of DC motors– Types of DC motors– Characteristics and uses of DC motors. Working principles of Single and Three phase transformers. Operating Principle of three phase and single phase induction motors– types and uses of induction motors.

Working principles of MC and MI voltmeters and Ammeters, Dynamo meter type wattmeter, Induction type energy meter and Multimeter–types of wiring– requirements for house wiring–typical layout for a small house– earthing.

**Unit II**

DC Circuits: Definition of current, voltage, power and energy– DC voltage and current sources– resistance, types of resistors, series and parallel connections of resistors, current and voltage division–loop method of analysis of simple circuits.

AC Circuits: Sinusoidal signals – average, r.m.s values –inductance, capacitance and their V–I relationships. Analysis of simple single phase series circuits– power and power factor–phasor diagrams– Introductions to three phase AC circuits.

**Unit III**

Basic Electronics: Principle and characteristics, uses of PN junction Diode, Zenerdiode, BJT, FET, UJT, Thyristors,- Operating principle of Half wave, Full wave and Bridge rectifiers.

Digital Electronics and Principles of Communication Systems: Symbol, truth table and functions of basic logic gates, universal gates, Half adder, Full adder. Communication systems– Microwave, Satellite, Fibreoptic and ISDN (block diagram description only).

**Text Books:**

1. Nagrath, I.J., 2007. Elements of Electrical E n g i n e e r i n g , 2nd Edition, 14th reprint, Tata McGraw Hill Publishing Co. Limited, New Delhi.

**Reference Books:**

1. Gupta, B. R., 2002. *Principles of Electrical Engineering*, S. Chand &Co, NewDelhi.
2. Theraja. B.L & Theraja. A.K., 2000. *Electrical Technology, Vol. I, II, and IV*, S. Chand and Co., NewDelhi.
3. Floyd & Jain, 2009. *Digital Fundamentals*, 8th Edition, Person Education.
4. Anok Singh, 2006. *Principles of Communication Engineering*, 6th reprint, S. Chand & Company Ltd., Ram Nagar, NewDelhi.

**Course Outcomes:**

At the end of the course, the student will be able to

1. Provide comprehensive idea about simple circuit analysis, working principles of machines and common measuring instruments
2. Analyze the behavior of any dc and ac circuits
3. Characterize semiconductor devices that include diodes, BJT and digital functions.
4. Understand fundamental principles of communication systems.

| 00ES204 | BASIC ENGINEERING (MECHANICAL) | L | T | P |
|---|---|---|---|---|
| | | 2 | 0 | 0 |

**Course Objectives:**

- To familiarize the students the functioning of different types of Boilers, the mountings and accessories.
- To provide basic knowledge about the use of various machine tools and the basic principles of welding, brazing and soldering.
- To illustrate the concepts of various metal forming operations and metal joining techniques.

**Unit I**

Boilers: Classification – Description and working of Simple vertical boiler, Cochran boiler, Babcock and Wilcox boiler - Description and working of boiler mountings: water level indicator, Pressure gauge, Dead weight and Spring loaded Safety value, Fusible plug, Feed check value, Steam stop value and Blow–off cock - Description and working of boiler accessories: Economiser and Super heater.

**Unit II**

Prime Movers: Steam turbines: Principles and working of Impulse and Reaction turbines – Comparison. Gas turbines: Principles and working of Open cycle and Closed cycle gas turbines. Internal Combustion Engines: Classification – principal parts – comparison of two strike and four stroke engines – working principle of petrol and diesel engines.

**Unit III**

Machine Tools: Description of parts and operations performed – Lathe, Shaper and Drilling machine. Metal Forming: Hot working versus cold working; Hand forging – Principle and operations; Rolling – Principle, rolling mill configurations; Extrusion – Direct versus indirect extrusion**.**

Metal Joining: Gas welding – principle, Oxy-acetylene welding – equipment, types of flames, advantages and disadvantages – Arc welding - principle, advantages and disadvantages – Brazing – Torch brazing, dip brazing, furnace brazing, resistance brazing – Soldering – Comparison of brazing and soldering.

**Text Books:**

1. Prabhu T J, Jaiganesh V and Jebaraj S, Basic Mechanical Engineering, Scitech Publications Pvt. Ltd., Chennai, 2000.
2. Venugopal and Prabhuraj T J, Basic Mechanical Engineering, ARS publishers, Sirkali, 1996.

**Reference Books:**

1. Hajra Choudhury S. K., Nirjhar Roy, Hajra Choudhury A. K., Elements of Workshop Technology,(Vol 1 and Vol II,) , Media Promoters, Pvt Ltd. (2008)
2. Rao P. N., Manufacturing Technology : Foundry, Forming and Welding - Vol 1,Mc Graw Hill Education, (2013)
3. Steven R. Schmid, Serope Kalpakjian, Manufacturing Processes for Engineering Materials (English) 5th Edition, Pearson India, ( 2009)

**Course Outcomes:**

1. Understand the construction and working principles of boiler operations
2. Distinguish between steam turbines and gas turbines.
3. Select suitable manufacturing methods to produce a new component.

**Course Outcomes for Basic Engineering:**

At the end of the course, the student will be able to

1. Acquire Knowledge on the essentials of Civil, Mechanical and Electrical Engineering.
2. Familiarize with the various civil engineering materials, electrical equipment and machine tools.
3. Understand the working principle of boilers, turbines and electrical machines.
4. Gain overview on surveying, construction, bridges, electronic devices, communication systems, welding and soldering.
5. Develop skills to satisfy the societal needs.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | 3 |
| **CO2** | 3 | - | - | - | - | - | 1 | - | | - | - | - |
| **CO3** | 3 | - | - | - | - | - | - | - | | - | - | - |
| **CO4** | 3 | - | - | - | - | 2 | 1 | - | 2 | - | - | - |
| **CO5** | - | - | - | - | - | 3 | 2 | 1 | 2 | - | - | 1 |

| 00HP205 | COMMUNICATION SKILLS AND LANGUAGE LABORATORY | L | T | P |
|---|---|---|---|---|
| | | 0 | 2 | 3 |

**Course Objectives:**

- The Language Lab focuses on the production and practices of sounds of language.
- The Language Lab familiarizes the students with the use of English in everyday situations and contexts.

**Theoretical Session (Internal Assessment only)**

1. English sound pattern
2. Sounds of English
3. Pronunciation
4. Stress and Intonation
5. Situational Dialogues/ Role play
6. Oral presentations- Prepared or Extempore
7. 'Just a Minute' sessions (JAM)
8. Describing Objects /situations/ people
9. Debate
10. Giving Directions

**Practical Session**

- To make the students recognize the sounds of English through Audio Visual Aids
- To enable the students speak fluently without fear
- To develop their communicative skill with individual practice through the prescribed package
- The Globarena Package consists of the following exercises
    1. Reading comprehension
    2. Listening comprehension
    3. Vocabulary exercises
    4. Phonetics
    5. Role Play in dialogues
    6. Auto Speak

**Reference Books:**

1. Globarena Package for communicative English
2. Cambridge Advanced Learner's English Dictionary
3. Spoken English (CIEFL) in 3 volumes with 6 cassettes, OUP.
4. English Pronouncing Dictionary Daniel Jones Current Edition with CD.
5. Spoken English- R. K. Bansal and J. B. Harrison, Orient Longman 2006 Edn
6. A Practical course in English Pronunciation, (with two Audio cassettes) by J. Sethi, KamleshSadanand& D.V. Jindal, Prentice-Hall of India Pvt. Ltd., New Delhi.
7. A text book of English Phonetics for Indian Students by T.Balasubramanian (Macmillan)
8. English Skills for Technical Students, WBSCTE with British Council, OL.

**DISTRIBUTION AND WEIGHTAGE OF MARKS**

English Language Laboratory Practical Paper:

1. The practical examinations for the English Language Laboratory shall be conducted as per the University norms prescribed for the core engineering practical sessions.

2. For the Language lab sessions, there shall be a continuous evaluation during the year for 40 sessional marks and 60 year-end Examination marks. The year- end Examination shall be conducted by the teacher concerned with the help of another member of the staff of the same department of the same institution.

**Course Outcomes:**

1. Realize the essentiality of the informal conversation.
2. Become familiar with different speaking skills.
3. Gain confidence to speak and write on similar topic.
4. Improve listening & speaking skills. Includes oral reports conference procedures and everyday conversations.
5. Continue to speak with reduced anxiety by recognizing and using communication strategies.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | - | - | - | - | - | - | 2 | - | 2 | 3 | - | 3 |
| **CO2** | - | - | - | - | - | - | 2 | - | 2 | 3 | - | 3 |
| **CO3** | - | - | - | - | - | - | 2 | - | 2 | 3 | - | 3 |
| **CO4** | - | - | - | - | - | - | 2 | - | 2 | 3 | - | 3 |
| **CO5** | - | - | - | - | - | - | 2 | - | 2 | 3 | - | 3 |

| **00BP206** | **APPLIED PHYSICS LABORATORY** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **0** | **0** | **3** |

**Course Objectives:**

The ability to offer students a variety of research opportunities

- To determine the radius of curvature of the plano convex lens and the wavelength of the sodium light by measuring the diameter of Newton's rings.
- We can use a spectrometer to measure this angle of deviation.
- To measure the modulus of elastic material by torsional pendulum and bending of a beam.
- To determine the resistivity of a given steel and brass wire.
- To find the velocity of ultrasonic waves in a liquid.
- Less viscosity of the liquid by poiseuille's method.

**List of Experiments (Any Ten)**

1. Non-Uniform Bending - Determination of Young's modulus of the given scale or beam.
2. Newton's rings- Determination of Radius of curvature of the given Plano convex lens.
3. Viscosity –Determination of co-efficient of Viscosity of a highly viscous liquid by Stoke's method.
4. Spectrometer – Dispersive power of a given prism.
5. Torsional Pendulum – Determination of Moment of Inertia of the metallic disc and Rigidity Modulus of the material of a wire.
6. Field along the axis of a coil- Determination of horizontal earth magnetic flux density.
7. Air wedge – Determination of thickness of a given thin wire and paper.
8. Viscosity - Determination of co-efficient of Viscosity of a less viscous liquid by

Capillary flow method

9. Uniform bending- Determination of Young's modulus of the given scale or beam.
10. Spectrometer – Determination of wavelength of the prominent spectral lines using Grating.
11. Semiconductor diode laser – Determination of wavelength of Laser source using Grating.
12. Band gap determination of a Semiconductor.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquired the knowledge of torsional properties of metals wire.
2. Generalized the dispersion of light through the prism.
3. Calculate the wavelength of monochromatic and polychromatic source of light.
4. Analyze diffraction patterns can be formed by light passing through a series of fine lines.
5. Estimate the size and shape of given unknown fine powder using laser gratings.

| Mapping of Course Outcomes with Program Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | 2 | - | 3 | 2 | 1 | - | - | - | - | - |
| **CO2** | 3 | 3 | - | - | 3 | 1 | 1 | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | - | 3 | 1 | 1 | - | - | 1 | - | - |
| **CO4** | 3 | 2 | 2 | - | 2 | 2 | 1 | - | - | 1 | - | - |
| **CO5** | 3 | 2 | 2 | - | 3 | 1 | 1 | - | - | 1 | - | - |

| **00BP207** | **APPLIED CHEMISTRY LABORATORY** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **0** | **0** | **3** |

**Course Objectives**

- To appreciate the practical significance of acidimetry, alkalimetry and permanganometry
- To analyse quantitatively the amount of a substance present in a given sample.
- To assess the composition of an alloy
- To test the water quality standards.

**LIST OF EXPERIMENTS**

1) Estimation of Potassium hydroxide
2) Estimation of Acetic acid in vinegar
3) Estimation of Temporary hardness of water sample
4) Estimation of Total hardness of water sample
5) Estimate separate amount of sodium carbonate and sodium hydroxide in a mixture .
6) Estimation of Ferrous sulphate
7) Estimation of Mohr's salt
8) Estimation of ferrous iron
9) Estimation of Oxalic acid
10) Determination of available free chlorine in a water sample.
11) Estimation of copper in brass by iodometry
12) Estimation of iron by dichrometry
13) Estimation of nickel in an alloy.

**Course Outcomes:**

At the end of the course, the student will be able to

1. Calculate the quantity of acids and bases in industrial waste water.
2. Estimate temporary and total hardness of water sample.
3. Estimate the available chlorine in industrial waste.
4. Determine the quantity of metals in alloy.
5. Determine the quantity of iron in solutions by permanganometric method.

| Mapping of Course Outcomes with Program Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | - | 1 | - | 1 | 2 | - | - | - | - | - |
| **CO2** | 3 | 2 | - | 1 | - | 1 | 1 | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | 1 | 1 | - | - | - | - | - |
| **CO4** | 1 | 2 | - | 1 | - | - | 1 | - | - | - | - | - |
| **CO5** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |

| **00SP208** | **ENGINEERING WORKSHOP** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | **0** | **0** | **3** |

**Course Objectives:**

- To provide the students simple hands-on-experience in the basic aspects of production engineering in fitting, carpentry and sheet metal.

**Workshop Practice in the Shops:**

**Carpentry:** Use of hand tools – exercises in planning and making joints namely, half lap joint, dovetail joint, mortising and tenoning.

**Fitting:** Use of bench tools, vice, hammers, chisels, files, hacksaw, centre punch, twist drill, taps and dies – Simple exercises in making T joint and dovetail joints.

**Sheet Metal Work:** Use of hand tools – Simple exercises in making objects like cone, funnel, tray, cylinder.

**Smithy:** Demonstration of hand forging and drop forging.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Use basic tools of fitting, carpentry and sheet metal fabrication.
2. Experience in the fabrication of simple carpentry joints.
3. Develop skill to make simple fitting joints.
4. make simple shapes of sheet material.
5. Distinguish hand forging and drop forging operation.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | 1 | - | - | - | - | - | - | - | - | 1 |
| **CO2** | 3 | - | 1 | - | - | 1 | - | - | 2 | - | - | 2 |
| **CO3** | 3 | - | 1 | - | - | - | - | - | 2 | - | - | 1 |
| **CO4** | 3 | - | 1 | - | - | - | - | - | 2 | - | - | 1 |
| **CO5** | 3 | - | - | - | - | - | - | - | - | - | - | 1 |

## DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**VISION**

To provide a congenial ambience for individuals to develop and blossom as academically superior, socially conscious and nationally responsible citizens.

**MISSION**

- **M1**: Impart high quality computer knowledge to the students through a dynamic scholastic environment wherein they learn to develop technical, communication and leadership skills to bloom as a versatile professional.
- **M2**: Develop life-long learning ability that allows them to be adaptive and responsive to the changes in career, society, technology, and environment.
- **M3**: Build student community with high ethical standards to undertake innovative research and development in thrust areas of national and international needs.
- **M4**: Expose the students to the emerging technological advancements for meeting the demands of the industry.

## B. E. (CSE) - PROGRAMME EDUCATIONAL OBJECTIVES (PEO)

| PEO | PEO Statements |
|---|---|
| **PEO1** | To prepare graduates with potential to get employed in the right role and/or become entrepreneurs to contribute to the society. |
| **PEO2** | To provide the graduates with the requisite knowledge to pursue higher education and carry out research in the field of Computer Science. |
| **PEO3** | To equip the graduates with the skills required to stay motivated and adapt to the dynamically changing world so as to remain successful in their career. |
| **PEO4** | To train the graduates to communicate effectively, work collaboratively and exhibit high levels of professionalism and ethical responsibility. |

## B.E. (CSE) – PROGRAMME OUTCOMES (PO)

After the successful completion of the B.E(CSE) degree program the students will be able to :

| Sl. No. | Program Outcomes |
|---|---|
| PO1 | **Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. |
| PO2 | **Problem Analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences. |
| PO3 | **Design/Development of Solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. |
| PO4 | **Conduct Investigations of Complex Problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions. |
| PO5 | **Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| PO6 | **The Engineer and Society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice. |
| PO7 | **Environment and Sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. |
| PO8 | **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. |
| PO9 | **Individual and Team Work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. |
| PO10 | **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and |

| | |
|---|---|
| | write effective reports and design documentation, make effective presentations, and give and receive clear instructions. |
| **PO11** | **Project Management and Finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments. |
| **PO12** | **Life-long Learning:** Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change. |

## B.E (CSE) - CONSISTENCY OF PEOS WITH MISSION OF THE DEPARTMENT

| PEO Statements | Mission Statements | | | |
|---|---|---|---|---|
| | **M1** | **M2** | **M3** | **M4** |
| **PEO1:** To prepare the graduates with the potential to get employed in the right role and/or become entrepreneurs to contribute to the society. | 2 | 3 | 2 | 3 |
| **PEO2:** To provide the graduates with the requisite knowledge to pursue higher education and carry out research in the field of Computer Science. | 2 | 2 | 3 | 2 |
| **PEO3:** To equip the graduates with the skills required to stay motivated and adapt to the dynamically changing world so as to remain successful in their career. | 2 | 3 | 2 | 3 |
| **PEO4:** To train the graduates to communicate effectively, work collaboratively and exhibit high levels of professionalism and ethical responsibility. | 3 | 3 | 2 | 3 |

3-Strong Correlation 2-Moderate Correlation 1-Weak Correlation

## B.E. (CSE) – MAPPING OF PEOs WITH POs

| Mapping of PEOs with POs | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **PEO1** | 3 | 2 | 3 | 2 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 |
| **PEO2** | 3 | 2 | 3 | 2 | 2 | - | - | - | - | 1 | - | 2 |
| **PEO3** | 2 | 2 | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 2 | - | 3 |
| **PEO4** | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 2 | 1 |

3-Strong Correlation 2-Moderate Correlation 1-Weak Correlation

| 00HS301 | ENVIRONMENTAL STUDIES | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To provide basic knowledge on natural resources .
- To describe the types, characteristic features, structure and function of an ecosystem.
- To expose information about biodiversity richness and the political angers to the species of plants, animals and microorganisms.
- To educate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value.
- To teach problem of over population, health and hygiene and also the role of technology in eliminating or minimizing above factors.

**UNIT - I**

Introduction - Multidisciplinary nature of environmental studies - Definition, scope and importance - Need for public awareness.

Natural resources - Forest resources: use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification - Role of an individual in conservation of natural resources- Equitable use of resources for sustainable lifestyles.

**UNIT - II**

Concept of an ecosystem - Structure and function of an ecosystem - Producers, consumers and decomposers - Energy flow in the ecosystem - Ecological succession - Food chains, food webs and ecological - pyramids - Introduction, types, characteristic features, structure and function of the following ecosystem - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT - III**

Introduction – Definition: genetic, species and ecosystem diversity - Bio geographical classification of India - Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values - Biodiversity at global, National and local levels - India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts - Endangered and endemic species of India - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity

**UNIT - IV**

Definition - Cause, effects and control measures of Air pollution - Water pollution - Soil pollution - Marine pollution- Noise pollution - Thermal pollution - Nuclear hazards- Solid waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Disaster management : floods, earthquake, cyclone and landslides.

Sustainable development - Urban problems related to energy - Water conservation, rain water harvesting, and watershed management - Resettlement and rehabilitation of people; its problems and concerns. - Environmental ethics: Issues and possible solutions - Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust.

Wasteland reclamation - Consumerism and waste products - Environment Protection Act - Air (Prevention and Control of Pollution) Act - Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation.

**UNIT - V**

Population growth, variation among nations - Population explosion – Family Welfare Programme - Environment and human health - Human Rights - Value Education - HIV/AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health -Case Studies.

**Text Books:**


1. Agarwal, K.C. 2001 Environmental Biology, Nidi Publ. Ltd. Bikaner.
2. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad – 380 013, India, Email:mapin@icenet.net (R)


**Reference Books:**


1. Brunner R.C., 1989, *Hazardous Waste Incineration*, McGraw Hill Inc. 480p
2. Clark R.S., *Marine Pollution*, Clanderson Press Oxford
3. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, *Environmental Encyclopaedia*, Jaico Publ. House, Mumbai, 1196p
4. De A.K., *Environmental Chemistry*, Wiley Eastern Ltd.
5. *Down to Earth*, Centre for Science and Environment
6. Gleick, H.P. 1993. *Water in crisis*, Pacific Institute for Studies in Dev., Environment & Security. Stockholm Env. Institute Oxford Univ. Press. 473p
7. Hawkins R.E., *Encyclopaedia of Indian Natural History*, Bombay Natural History Society, Bombay
8. Heywood, V.H & Waston, R.T. 1995. *Global Biodiversity Assessment*. Cambridge Univ. Press 1140p.
9. Jadhav, H & Bhosale, V.M. 1995. *Environmental Protection and Laws*. Himalaya Pub. House, Delhi 284 p.
10. Mckinney, M.L. & School, R.M. 1996. *Environmental Science systems & Solutions*, Web enhanced edition. 639p.
11. Mhaskar A.K., *Matter Hazardous*, Techno-Science Publication
12. Miller T.G. Jr. *Environmental Science*, Wadsworth Publishing Co.
13. Odum, E.P. 1971. *Fundamentals of Ecology*. W.B. Saunders Co. USA, 574p
14. Rao M N. & Datta, A.K. 1987. *Waste Water treatment*. Oxford & IBH Publ. Co. Pvt. Ltd. 345p.
15. Sharma B.K., 2001. *Environmental Chemistry*. Geol Publ. House, Meerut
16. Survey of the Environment, The Hindu (M)
17. Townsend C., Harper J, and Michael Begon, *Essentials of Ecology*, Blackwell Science
18. Trivedi R.K., *Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards*, Vol I and II, Enviro Media (R)
19. Trivedi R. K. and P.K. Goel, *Introduction to air pollution*, Techno-Science Publication

20. Wanger K.D., 1998 *Environmental Management*. W.B. Saunders Co. Philadelphia, USA 499p.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand renewable and non-renewable resources of our ecosystem.
2. Compare ecological system, causes and their relationship.
3. Explain political angers to the species of plants, animals and microorganisms in the environment and the threats to biodiversity
4. Analyse the causes and consequences of natural and man induced disasters (flood, earthquake, landslides, cyclones) and measure pollutions and minimize their effects.
5. Design modes with the help of information technology for eliminating or minimizing the problems of Environment and human health.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | - | 1 | 3 | - | - | - | - | - |
| **CO2** | 1 | - | - | - | - | 1 | 3 | - | - | - | - | - |
| **CO3** | 1 | - | - | - | - | 2 | 3 | - | - | - | - | - |
| **CO4** | 2 | 1 | - | - | - | 2 | 3 | - | - | - | - | - |
| **CO5** | 1 | - | 2 | 1 | - | 3 | 3 | - | - | - | - | - |

| **00BS302** | **ENGINEERING MATHEMATICS III** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To familiarize the basic concepts of partial differential equation which is helpful in solving real world problems.
- To introduce Fourier series which is very useful in the study of computing.
- To solve boundary value problems which is helpful in investigation of the important features of electromagnetic theory.
- To provide basics of Fourier transform which is useful in solving problems in frequency response of a filter and signal analysis.
- To impart knowledge about z-transform which can played important role in the development of communication engineering.

**UNIT - I**

Partial Differential Equations - Formation of partial differential equations by eliminating arbitrary constants and arbitrary functions - Solution of standard type of first order partial differential equations - Lagrange's linear equation - Linear partial differential equations of second order with constant coefficients.

**UNIT - II**

Fourier Series - Dirichle's conditions - General Fourier series - Odd and Even functions - Half range sine series - Half range cosine series - Complex form of Fourier series – Parseval's identity.

**UNIT - III**

Boundary value problems - Solutions of one dimensional wave equation – One dimensional heat equation (without derivation) – Fourier series solutions in Cartesian co-ordinates.

**UNIT - IV**

Fourier Transform - Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem - Parseval's identity.

**UNIT - V**

Z - Transform – Elementary properties – Inverse Z – Transform - Convolution theorem – Solution of difference equations using Z – Transform.

**Text Books:**

1. Kandasamy P, Tilagavathy K and Gunavathy K, "Engineering Mathematics", 6thedition, (Vol I & II) S.Chand& Co Ltd. 2006, New Delhi.
2. Ventakataraman M K, "Engineering Mathematics", The National Publishing Co., Chennai,2003

**Reference Books:**

1. Veerarajan T, "Engineering Mathematics", 3 rd edition, Tata McGraw Hill Pub., 2005.
2. Singaravelu A, "Engineering Mathematics", Meenakshi Publications, Chennai, 2004.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire the basic of the most common partial differential equations.
2. Understand the concepts of Fourier series.
3. Analyze boundary value problems.
4. Investigate signals problems using Fourier Transform.
5. Implement z-transform in many discrete engineering problems.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - |

| **00ES303** | **ENGINEERING MECHANICS** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To make the students to understand the forces and its related laws of mechanics in static and dynamic conditions
- To teach the forces and its motions on particles, rigid bodies and structures.
- To train the students to find the moment inertia of any sections and masses for the structural members.

- To impart skills to solve problems in dynamic conditions
- To explain the significance of friction

**UNIT - I**

Introduction - Units and Dimensions - Laws of Mechanics - Lami's Theorem - Parallelogram, Triangular and Polygon Law of Forces - Classification of Forces - Vectorial Representation of Forces

Coplanar Forces - Resolution of Forces.

Equilibrium of Particle - Vector representation of Space Force - Equilibrium of Particle in Space - Equivalent System of Forces - Principle of Transmissibility

**UNIT - II**

Free Body Diagram - Types of Supports - Types of loads - Types of beams - Action and Reaction of Forces - Moments and Couples - Moment of a Force - Vectorial Representation of Moments and Couples.

Varignon's Theorem - Stable Equilibrium - Single Equivalent Force - Equilibrium of Rigid Bodies in Two Dimensions and Three Dimensions.

**UNIT - III**

Centroid and Centre of Gravity - Determination of Centroid of Sections of Different Geometry - Centre of Gravity of a Body - Area Moment of Inertia – Parallel Axis Theorem - Perpendicular Axis Theorem - Determination of Moment of Inertia of Rectangular, Triangular, Circular and Semi-circular areas from the first principle- Moment of Inertia of structural Steel Sections of Standard Flanged and Composite Sections.

Polar Moment of Inertia - Radius of Gyration - Principal Moment of Inertia - Mass Moment of Inertia

Determination of Mass Moment of Inertia of a Rod, Thin Rectangular Plate, Thin Circular Disc, solid Prism, Cylinder, Sphere and Cone from the first principles.

**UNIT - IV**

Introduction - Kinematics and Kinetics - Displacements, Velocity and Acceleration - Equations of Motion - Types of Motion-Rectilinear Motion - Relative Motion - Curvilinear Motion - Projectiles.

Newton's Laws of Motion - Linear Momentum - Impulse and Momentum - D'Alembert's Principle - Dynamic Equilibrium - Work Energy Equations - Law of Conservation of Energy - Principle of Work and Energy.

**UNIT - V**

Friction Force - Laws of Sliding Friction - Equilibrium Analysis of simple systems with Sliding Friction - Wedge Friction.

Rolling Resistance- Translation and Rotation of Rigid Bodies - Velocity and Acceleration - General Plane Motion of Simple Rigid Bodies such as Cylinder, Disc/Wheel and Sphere.

**Text Books:**

1. Beer F.P and Johnson R, Vector Mechanics for Engineers (Statics), McGraw- Hill Book Company, New Delhi, 2004.
2. Palanichamy M.S and Nagan, S, Engineering Mechanics (Statics and Dynamics), Tata McGraw Hill Publishing Company, Ltd., New Delhi, 2010.

**Reference Books:**

1. Bansal.R.K, Engineering Mechanics, Laxmi Publications, New Delhi, 2007.

2. Bhavikatti.S.S. and Rajasekarappa K.G.,Engineering Mechanics, New Agent International (P) Ltd, New Delhi, 1999.
3. Sadhu Sing,Engineering Mechanics, Oxford & IBH Publishing Co., New Delhi, 2000.
4. Irving H. Shames,Engineering Mechanics, Prentice Hall of India Ltd., New Delhi, 2006.
5. Hibbeller, R.C and Ashok Gupta, Engineering Mechanics: Statics and Dynamics, Edition, Pearson Education, Chennai, 2010.
6. Natesan S.C, Engineering Mechanics ( Statics and Dynamics), First Edition, Umesh Publications, New Delhi,2002.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the forces and its related laws of mechanics in static and dynamic conditions
2. Analyze the forces and its motions on particles, rigid bodies and structures.
3. Solve the moment inertia of any sections and masses for the structural members.
4. Able to solve problems in dynamic conditions.
5. Understand the significance of friction.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | 2 |
| **CO2** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | 2 |
| **CO5** | 3 | 3 | 3 | - | - | - | - | - | - | - | - | - |

| **08ES304** | **BASIC ELECTRONICS ENGINEERING** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To understand the characteristics of diodes, FET, UJT, SCR and IGBT along with their applications.
- To familiarize with the CB, CE, CC Configurations and Classification of amplifiers.
- To demonstrate the operations of phase-shift oscillator, Wein-bridge oscillator, Hartley, Colpitts, Crystal oscillator and BJT differential amplifiers.
- To teach digital problems using maps and to provide knowledge on Multiplexer, De-multiplexer, Decoder and Code converter.
- To explain sequential logic design, Memory circuit and systems with PLA and PAL architecture.

**UNIT - I**

Semiconductor Devices: Review of behaviour of PN junction diode-Characteristics-piecewise linear model of a diode – Applications – Rectifier circuits – filters – critical inductance and bleeder resistance – Zener diode - principle of operation – characteristics - Zener diode as a voltage regulator. Principle of operation, characteristics and applications of FET, UJT,SCR, IGBT.

**UNIT - II**

Transistors: Bipolar junction transistor-Current components - CB, CE, CC, Configuration-input and output characteristics- Transistor biasing and thermal stabilization - Transistor as an amplifier-Classification of amplifiers - Low frequency response of a RC coupled amplifier and influence of bypass capacitor. Transformer coupled amplifier- Power amplifiers-Classification-class A, B, AB-single ended, push pull configurations-power dissipation-output power, efficiency, distortion-complementary symmetry.

**UNIT - III**

Feedback and Differential Amplifiers: Positive and negative feedback - Effects of negative feedback-Loop gain-Types of negative feedback. Oscillators - Requirements for oscillation – phaseshift oscillator – Weinbridge oscillator, Hartley, Colpitts and crystal oscillator- Multivibrators- Schmitt trigger circuit-.Analysis of BJT differential amplifiers-Differential voltage gain - CMRR.

**UNIT - IV**

Combinational Logic: Transistor as a switch - Reversible stable states - Laws of boolean algebra-Boolean expressions and logic diagrams- Negative logic - Introduction to mixed logic - Min Terms and Max Terms - Truth tables and maps - Solving digital problems using maps - Sum of products and product of sums map reduction - Hybrid functions-Incompletely specified functions - Multiple output minimization - Implementation of Boolean expressions using AND, OR, INVERT Logic gates& Universal gates-Multiplexer - Demultiplexer - Decoder - Code converter.

**UNIT - V**

Sequential Logic: Sequential logic - Flip-flops - Counters - Types of counters - Ripple counter design - Type T, type D and type JK design – Shift registers- Memory circuit and systems ROM, PROM, EPROM,EEPROM, RAM, DRAM - PLA,PAL architecture.

**Text Books:**

1. Morris Mano, "Digital Logic and Computer Design", Prentice Hall, Fourth Edition, 2013.
2. Rashid, "Microelectronic circuits", Thomson Publications, 2010.

**Reference Books:**

1. Floyd, "Electron Devices", Pearson Asia, 5th Edition, 2013.
2. R.P. Jain, "Modern Digital Electronics", Tata McGraw Hill, 4th Edition, 2010.
3. Donald P Leach, Albert Paul Malvino, Goutan Saha, "Digital Principles and Applications", Seventh Edition, 2010.
4. V.K. Mehta, Rohit Mehta, "Principles of Electronics", S.Chand Publications, 2005.
5. Donald A Neamen, "Electronic Circuit Analysis and Design", Tata McGraw Hill, 5th Edition, 2007.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Analyze the characteristics of diodes, FET, UJT, SCR andIGBT along with their applications.
2. Evaluate the characteristics of transistors and amplifiers.
3. Demonstrate the operations of phase-shift oscillator, Wein-bridge oscillator, Hartley, Colpitts, Crystal oscillator and BJT differential amplifiers.
4. Formulate digital problems using maps and construct Multiplexer, De-multiplexer,

Decoder and Code converter.

5. Design sequential logic, Memory circuit and systems with PLA and PAL architecture.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 1 | 3 | 2 | - | - | - | - | - | - | - | - |

| **08PC305** | **MICROPROCESSORS** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To familiarize with the architecture of 8086 microprocessor including stacks, procedures, interrupts and instruction set.
- To impart knowledge on 8086, 80186, 80286, 80386, 80486 and Pentium processors.
- To demonstrate the Memory interfacing and I/O interfacing with the case studies.
- To explain the architecture of 8031/ 8051 and 16 bit controller.
- To analyze the role of 8051 microcontroller in ADC, DAC, Stepper Motor and Waveform generation.

**UNIT - I**

Introduction to 8086 – Microprocessor architecture – Addressing modes – Instruction set and assembler directives – Assembly language programming – Modular Programming – Linking and Relocation – Stacks – Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

**UNIT - II**

8086 Architecture –Basic Configuration – 8086 Minimum and Maximum mode configurations – Addressing modes – Basic Instructions – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure — 8086 Interrupts – Assembly levels programming – Introduction to 80186 – 80286 – 80386 – 80486 and Pentium processors.

**UNIT - III**

Memory Interfacing and I/O interfacing – Parallel communication interface – Serial communication interface – D/A and A/D Interface – Timer – Keyboard/display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

**UNIT - IV**

Architecture of 8031/ 8051 – Special Function Registers (SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes – Assembly language programming -Introduction to 16 bit Microcontroller.

**UNIT - V**

Programming 8051 Timers – Serial Port Programming – Interrupts Programming – LCD & Keyboard Interfacing – ADC, DAC & Sensor Interfacing – External Memory Interface- Stepper Motor and Waveform generation.

**Text Books:**

1. Yu-Cheng Liu, Glenn A. Gibson, "Microcomputer Systems: The 8086 / 8088 Family – Architecture, Programming and Design", Prentice Hall of India, Second Edition, 2007.
2. Muhammed Ali Mazidi, Janice Gillispie Mazidi, RolinMcKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Pearson Education, Second Edition, 2011.

**Reference Books:**

1. Doughlas V. Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH, 2012.
2. Ramesh S. Gaonkar, "Microprocessor Architecture Programming and Applications with 8085", Penram International Publishing, Fourth Edition, 2000.
3. Kenneth J. Ayala., "The 8051 Microcontroller Architecture Programming and Applications", Penram International Publishing (India), 1996.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire the basic knowledge on the architecture of 8086 microprocessor including Addressing modes, Instruction set. Assembly language programming, Stacks, Macros, Interrupts and interrupt service routines.
2. Develop the programming skills on 8086 and comprehend the other microprocessors such as 80186, 80286, 80386, 80486 and Pentium processors
3. Design and develop the Traffic Light control, LED display, LCD display, Keyboard display interface and Alarm Controller through memory and I/O interfacing.
4. Derive programming knowledge on 8031/ 8051 microcontroller covering Special Function Registers, I/O Pins Ports and Circuits and also acquire familiarity on 16 bit Microcontroller.
5. Implement Programs for 8051 Timer, ADC, DAC, Stepper Motor and for Waveform generation.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - | - |

| 08PC306 | DATA STRUCTURES AND ALGORITHMS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To provide in-depth knowledge on linear structures.
- To familiarize with Trees structures.
- To describe Hashing and sets.
- To demonstrate the design and analysis of algorithms
- To educate different Graph techniques.

**UNIT - I**

Linear structures: Abstract Data Types (ADT) – List ADT – array-based implementation – linked list implementation – cursor-based linked lists – doubly-linked lists – applications of lists – Stack ADT – Queue ADT – circular queue implementation – Applications of stacks and Queues.

**UNIT - II**

Tree structures: Tree ADT – tree traversals – left child right sibling data structures for general trees – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT – Threaded Binary Trees- AVL Trees – Splay Trees – B-Tree - heaps – binary heaps – applications of binary Heaps

**UNIT - III**

Hashing and set: Hashing – Separate chaining – open addressing – rehashing – extendible hashing - Disjoint Set ADT – dynamic equivalence problem – smart union algorithms – path compression – applications of Set

**UNIT - IV**

Algorithms : Definition- Efficiency of Algorithms- Average and worst case Analysis- What is an elementary Operations- Asymptotic Notation- Notation for the order of – Other Asymptotic Notations- Analysing control structures- Greedy Algorithms- Minimum Spanning Tree- Prim's and Kruskal's algorithms – Knapsack problem

**UNIT - V**

Graphs: Divide and Conquer Methods – Quick sort – Binary Search- Dynamic Programming – The principle of optimality - Shortest Path problem - Chained matrix Multiplication- Exploring Graphs- Depth first Search- Breath first search-Backtracking- 8 Queen's Problem

**Text Books:**

1. G. Brassard and P. Bratley, Fundamentals of Algorithmics, Prentice-Hall, 2009.
2. M. A. Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, 2005.

**Reference Books:**

1. A. V. Aho, J. E. Hopcroft, and J. D. Ullman, "Data Structures and Algorithms", Pearson Education, First Edition Reprint 2003.
2. R. F. Gilberg, B. A. Forouzan, "Data Structures", Second Edition, Thomson India, 2005.
3. M.A. Weiss, "Data Structures and Algorithm Analysis in C++", Benjamin Cummings, 1994.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Design and implement linear structures including linked list, stacks, and queues.
2. Construct and implement Tree ADT including binary tree, AVL tree and B- Tree.
3. Analyze and classify different hashing, chaining and set concepts.
4. Build and evaluate efficiency of algorithms including greedy algorithms, minimum spanning tree, prim's and kruskal's algorithm, knapsack Problem.
5. Construct and experiment with Graph techniques including divide and conquer method, quick sort, DFS, BFS, 8 queen's problem, chained matrix and shortest path problem.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 1 | - | 2 | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | - | - | 2 | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | - | - | 2 | - | - | - | - | - | - | - |

| **08SP307** | **BASIC ELECTRONICS ENGINEERING LAB** | **L** | **T** | **P** |
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| | | 0 | 0 | 3 |

**Course Objectives:**

- To train the students to experiment and analyze the characteristics of diode, Rectifiers, transistors, Oscillators and Multivibrators.
- To develop the skills required to implement the concepts of Digital Logic design such as logic gates, RS/JK Flip-flops, Multiplexer and De-multiplexer.

**LIST OF EXERCISES**

1. Characteristics of semiconductor diode
2. Characteristics of Zener diode and Zener diode as a voltage regulator
3. Estimation of ripple factor and efficiency in a full wave / Bridge rectifier with and without filter
4. Characteristics of CE PNP and NPN transistor
5. Frequency response of RC coupled amplifier
6. Estimation of gain and efficiency in a class B power amplifier
7. Measurement of frequency of the output voltage in a RC phase shift oscillator
8. Estimation of the frequency of the output voltage of a Bestable Multivibrator
9. Verification of Truth table of AND / OR / NOT / NAND/ NOR / XOR gates
10. Reduction of variables using KMap
11. Study of multiplexer and Demultiplexer
12. Verification of state table of RS / JK flip flop.

**Course Outcomes:**

At the end of this course, the students will be able to:

1. Analyze the characteristics of diode, Rectifiers, transistors, Oscillators and Multivibrators.
2. Implement Digital logic circuits using logic gates, RS/JK Flip-flops, Multiplexer and De-multiplexer.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08CP308** | **MICROPROCESSOR LAB** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**Course Objectives:**

- To understand the architecture and arithmetic operations of 8085 and 8086 microprocessors.
- To illustrate the concepts in microprocessor interfacing and its applications.

**LIST OF EXERCISES**

1. Study of 8085 and study of 8086 microprocessor
2. 8-bit Arithmetic Operation
3. 16-bit Arithmetic Operation
4. Find the number of even and odd number in a block of data
5. Fibonacci series
6. Hexadecimal to binary conversion
7. Matrix Addition
8. Sorting an array of numbers
9. Searching a string
10. Digital clock
11. Square wave generation using 8253IC
12. Stepper motor interface using 8255IC
13. Data transfer using USART
14. Keyboard status
15. Message display 8279IC
16. Simulation of traffic light control signal

**Course Outcomes:**

At the end of this course, the students will be able to

1. Solve the Assembly level programs using the 8085 and 8086 instruction set.
2. Design 8086 to 8255 interface, Keyboard, display and stepper motors and simulate traffic light control signal.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08BS401** | **DISCRETE MATHEMATICS** | **L** | **T** | **P** |
|---|---|---|---|---|
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**Course Objectives:**

- To introduce the basic concepts of Mathematical Logic that deals with the method of reasoning.
- To impart knowledge about sets and relations.
- To provide basic understanding of Boolean algebra.
- To familiarize the basic properties and concepts of general algebraic systems.
- To illustrate graph theory and its application to computer science.

**UNIT - I**

Mathematical Logic: Propositions – Connectives – Tautology and contradiction – Equivalence of prepositions – Tautological Implication – Normal Forms – Theory of Inference – Rules of Inference.

**UNIT - II**

Set Theory and Relations: Set operations – Ordered pairs and Cartesian product – Relations – Type of relations – Operations or relations – Properties of relations – Equivalence classes – Partition of set – Matrix and Graphical representation of relation.

**UNIT - III**

Lattice and Boolean Algebra: Partial ordered set – Hasse diagram – Lattices – Properties of Lattices – Boolean Algebra – Karnaugh map method.

**UNIT - IV**

Group and Group code: Algebraic systems – Semi groups and Monoids – Groups – Permutation Group – Subgroups – Coding Theory – Group codes – Hamming codes – Procedure for Encoding and Decoding Group codes.

**UNIT - V**

Graph Theory: Graphs – Special simple graphs – Matrix representation of graphs – Path cycles and connectives – Eulerian and Hamiltonian graphs – Shortest path algorithms.

**Text Book:**

1. Veerarajan T, "Discrete Mathematics with Graph Theory and Combinatorics", Tata McGraw Hill Publishing Company Ltd, 2014.

**Reference Books:**

1. Venkataraman M K, "Discrete Mathematics", The National Publishing Company, 2008.
2. Kolman Busby Ross, "Discrete Mathematical Structures", Pearson Education Pvt Ltd, 2000.
3. Trembley J P and Manohar R P, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing Company Ltd, 2005.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire the basic concepts in Mathematical Logic and theory of inferences.
2. Understand the concepts of Set theory, Relations and equivalence classes with matrix representation.
3. Familiarize Lattice theory, Boolean algebra and Group theory
4. Design coding and encoding group codes concept.
5. Understand the basic concepts of Graph theory, Eulerian and Hamiltonian graphs.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 3 | 2 | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 3 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | 1 | - | - | - | - | - | - | - | - | - |

| **08ES402** | **MATERIALS SCIENCE** | **L** | **T** | **P** |
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**Course Objectives:**

- To enable the students to understand the electrical conduction in materials using free electron theory.
- To provide in-depth knowledge on carrier concentration and the Fermi energy level of the p-type and n-type extrinsic semi-conductors.
- To explain the magnetic and dielectric nature of the materials.
- To impart knowledge for developing applications using optic materials
- To disseminate the knowledge on new engineering materials including nano phase materials and bio materials.

**UNIT - I**

Conducting Materials: Classical free electron theory of metals-electrical conductivity of Al - drawbacks of classical theory - quantum free electron theory of metals and its importance – density of states - Fermi-Dirac statistics - calculation of Femi energy and its importance - concept of hole-origin of band gap in solids (qualitative treatment only) - effective mass of electron-high resistivity alloys superconductors-properties and applications.

**UNIT - II**

Semiconducting Materials: Elemental and compound semiconductors and their properties-carrier concentration intrinsic semiconductors-carrier concentration in n-type and p-type semiconductors - variation of Fermi level and carrier concentration with temperature - Hall effect – applications.

**UNIT - III**

Magnetic And Dielectric Materials: Different types of magnetic materials and their properties-domain theory of ferromagnetism-Heisenberg criteria-Hysteresis Energy product of a magnetic material-merits and their applications- magnetic recording materials-metallic glasses - Active and passive dielectrics and their applications - Ferro electrics – Piezo electrics .

**UNIT - IV**

Optical Materials: Optical properties of metals, insulators and semiconductors - phosphorescence and fluorescence - excitons, traps and colour centres and their importance-different phosphors used in CRO screens-liquid crystals display material- Thermography and its applications-photoconductivity and photo conducting materials.

**UNIT - V**

New Engineering Materials: Metallic glasses as transformer core materials - Nano phase materials-Shape memory alloys-Bio-materials-Non-linear materials – Second harmonic generation-Optical mixing – Optical phase conjugation – Solutions – IC packaging material.

**Text Books:**

1. Arumugam M., "Materials Science", Anuradha Technical Book Publishers, 2005.
2. Indulkar C.S. and Thiruvengadem. S, "Introduction to Electrical Engineering Materials", 5th Edition, S.Chand & Co New Delhi, 2010.

**Reference Books:**

1. Raghavan.V., "Materials Science and Engineering", Prentice Hall of India, New Delhi, 2005.
2. Dekker A.J.,"Electrical Engineering Materials", Prentice Hall of India, 2006.
3. Rajput, R.K., "Electrical Engineering Materials", Laxmi Publications NewDelhi, 1993.
4. Simon S.M., "Physics of Semiconductor devices", 3rd Edition, Wiley Eastern, 2007.
5. Van Vlack L.H., "Material Science for Engineers", Addision Wesley 2000.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the electrical conduction in materials using free electron theory
2. Derive the carrier concentration and the Fermi energy level of the p-type and n-type extrinsic semi-conductors.
3. Understand the magnetic and dielectric nature of the materials.
4. Develop applications using optic material.
5. Build solution using nano phase materials and bio materials.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | - | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | - | 1 | 1 | - | - | - | - | - | - | - | - |

| **08PC403** | **DATA BASE MANAGEMENT SYSTEM** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the fundamentals of DBMS and E-R Diagrams.
- To impart the concepts of the Relational model and SQL.
- To disseminate the knowledge on various Normal Forms.
- To inculcate the fundamentals of transaction management and Query processing.
- To provide basic knowledge on current trends in data base technologies.

**UNIT - I**

Introduction: File System vs. DBMS – Views of data – Data Models – Database Languages – Database Management System Services – Overall System Architecture – Data Dictionary – Entity – Relationship (E-R) – Enhanced Entity – Relationship Model.

**UNIT - II**

Relational Approach: Relational Model – Relational Data Structure – Relational Data Integrity – Domain Constraints – Entity Integrity – Referential Integrity – Operational Constraints – Keys – Relational Algebra – Fundamental operations – Additional Operations –Relational Calculus - Tuple Relational Calculus – Domain Relational Calculus - SQL – Basic Structure – Set operations – Aggregate Functions – Null values – Nested Sub queries – Derived Relations – Views – Modification of the database – Joined Relations – Data Definition Language – Triggers.

**UNIT - III**

Database Design: Functional Dependencies – Pitfalls in Relational Database Design – Decomposition - Normalization using Functional Dependencies – Normalization using Multi-valued Dependencies – Normalization using Join Dependencies – Domain - Key Normal form.

**UNIT - IV**

Query Processing and Transaction Management: Query Processing Overview – Estimation of Query Processing Cost - Join strategies – Transaction Processing – Concepts and States – Implementation of Atomicity and Durability – Concurrent Executions – Serializability – Implementation of Isolation – Testing for Serializability – Concurrency control – Lock Based Protocols – Timestamp Based Protocols.

**UNIT - V**

Trends in Data Base Technologies: Distributed Databases - Homogeneous and Heterogeneous Databases - Distributed Data Storage - Distributed Transactions - Commit Protocols - Concurrency Control in Distributed Databases - Availability - Distributed Query Processing - Heterogeneous Distributed Databases- Cloud-Based Databases - Directory Systems.

**Text Books:**

1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Tata McGraw Hill, Sixth Edition, 2010.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Addision Wesley, Sixth Edition, 2010.

**Reference Books:**

1. Raghu Ramakrishnan, Johannes Gehrke "Database Management Systems", McGraw Hill,Third Edition, 2002.
2. Peter Rob and Carlos Coronel,"Database Systems – Design, Implementation and Management", Thompson Learning, Course Technology, Seventh Edition, 2006.
3. C. J. Date, A.Kannan , S.Swamynathan , "An Introduction to Database Systems", Addison Wesley, 8th Edition, 2012.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand database system features for designing data models to represent any database applications.
2. Solve queries using Relational Algebra, Relational Calculus and SQL.
3. Analyze the existing design of a database schema and apply concepts of normalization to design an optimal database.
4. Evaluate query processing cost and understand Transaction processing and concurrency control.
5. Build new concepts in database technologies including Distributed databases and Cloud-based databases.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO5** | 1 | - | - | - | 1 | - | - | - | - | - | - | - |

| 08PC404 | COMPUTER ARCHITECTURE | L | T | P |
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**Course Objectives:**

- To educate basic operational concepts and functional units of a Computer.
- To disseminate the knowledge of Hardwired control logic and Micro programmed control.
- To teach the concepts of Data hazards, Instruction Hazards and performance considerations.
- To illustrate the significance of Memory in the Computer with its types.
- To motivate the students for acquiring knowledge in accessing I/O devices on Computer.

**UNIT - I**

Functional units – Basic operational concepts – Bus structures – Performance and metrics – Instructions and instruction sequencing – Hardware – Software interface – Instruction set architecture – Addressing modes – RISC – CISC – ALU design – Fixed point and floating point operations.

**UNIT - II**

Fundamental concepts – Execution of a complete instruction – Multiple bus organization – Hardwired control – Micro programmed control – Nano programming.

**UNIT - III**

Basic concepts – Data hazards – Instruction hazards – Influence on instruction sets – Data path and control considerations – Performance considerations – Exception handling.

**UNIT - IV**

Basic concepts – Semiconductor RAM – ROM – Speed – Size and cost – Cache memories – Improving cache performance – Virtual memory – Memory management requirements – Associative memories – Secondary storage devices.

**UNIT - V**

Accessing I/O devices – Programmed I/O – Interrupts – Direct memory access – Buses – Interface Circuits – Standard I/O interfaces (PCI, SCSI, and USB) – I/O Devices and processors.

**Text Books:**

1. Carl Hamacher, Zvonko Vranesic, Safwat Zaky, “Computer Organization”, McGraw-Hill, Fifth Edition, Reprint 2012.
2. David A. Patterson and John L. Hennessy, “Computer Architecture-A Quantitative Approach”, Elsevier, a division of reed India Private Limited, Fifth edition, 2012.

**Reference Books:**

1. William Stallings, “Computer Organization and Architecture – Designing for Performance”, 6th Edition, Pearson Education, 2003.
2. Hayes, J.P., “Computer Architecture and Organization”, 3rd Edition, Tata Mc-Graw Hill, 1998.
3. Ghosh T. K., “Computer Organization and Architecture”, Tata McGraw-Hill, Third Edition, 2011.
4. Behrooz Parahami, “Computer Architecture”, Oxford University Press, Eighth Impression, 2011.
5. Heuring, V.P. and Jordan, H.F., “Computer Systems Design and Architecture”, 2nd Edition, Pearson Education, 2004.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Recognize the Bus structure and basic operational concepts of a Computer.
2. Understand how to execute the complete Instruction in Computer.
3. Differentiate the working of Data Hazards and Instruction Hazards on Computer.
4. Review the involvement of RAM and ROM Memories with the computer.
5. Classify the standard I/O interfaces and I/O devices of the Computer.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO4** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 1 | - | - | - | - | - | - | - | - | - | - | - |

| **08PC405** | **OBJECT ORIENTED PROGRAMMING AND C++** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the basic concepts of object-oriented programming approaches and its features.
- To provide the basics of C++ data types, Methods, objects and classes, control structures, constructor and destructors
- To prepare the students to write program solve mathematical and scientific problems using function and overloading of functions
- To make the student to learn the advance features of inheritance and virtual function.
- To prepare the programming skills of the students to write programs for file management and templates

**UNIT - I**

Introduction: Traditional Versus Object Orientation Approach – Benefits and applications of OOP– Characteristics of Object Oriented Programming Languages: Objects – Classes – Data encapsulation – Data hiding–Inheritance – Polymorphism –Overloading– Dynamic Binding – Message Passing – Extensibility.

**UNIT - II**

C++ Programming Basics: Overview–C++ Data Types–Basics of object and class in C++ – Program structure– Member Functions and Member Variable – Techniques for Creating and Initialising Objects – Initialising and Cleaning Objects – Data Hiding – Namespace– Identifiers– Variables – Constants– Operators– Typecasting– Control structures– Loops and Decisions –Constructors and their types – Destructor – Access specifiers: Private Public and Protected members.

**UNIT - III**

C++ Functions: Simple functions- Arguments passed by value and by reference- Overloading of

functions – Constructor Overloading-Inline functions - Passing and returning of objects- friend function - Friend Classes -Static Functions - Operator Overloading: Overloading Unary Operators- Overloading Binary Operators - Data Conversion: Conversions Between Objects and Basic Types - Conversions Between Objects of Different Classes.

**UNIT - IV**

Inheritance: Concept of Inheritance –Types of Inheritance: Single –Multiple – Multilevel – Hierarchical –Hybrid – Virtual Functions: Normal Member Functions Accessed with Pointers – Virtual Member Functions Accessed with Pointers – Abstract Classes and Pure Virtual Functions – Virtual Destructors –Virtual Base Classes – THIS Pointer.

**UNIT - V**

I/O and File Management, Templates, Exceptions and STL: C++ streams –C++ streams classes – Unformatted I/O Operations –Formatted console I/O Operations –Managing output with manipulators –File stream classes – Opening and Closing a Files –Finding end of file –File opening modes –File pointers and manipulators –Sequential input and Output operations –Exception Handling Fundamentals–try –catch –throw –multiple catch –Catching All Exceptions –Restricting Exceptions –Rethrowing an Exception –Implementing user defined exceptions –Overview and Use of Standard Template Library.

**Text Books:**

1. Robert Lafore, "Object -Oriented Programming in C++", Sams Publication, Fourth Edition, 2002.
2. Balagurusamy.E, "Object Oriented Programming with C++", Tata McGraw-Hill Publication, 2008.

**Reference Books:**

1. Herbert Schildt, "The Compete Reference C++" , Tata McGraw-Hill Publication, Third Edition, Fourth Edition,1998.
2. Safee Vohra, "Object Oriented Programming with C++", Bookrent.in Publication, First Edition, 2015.
3. M. T. Guru, D. S. Nagendraswamy, H. S.Manjunatha, K. S. Somashekara, "Object Oriented Programming with C++", PHI Publication, Second Edition, 2012.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the basic concepts of Object oriented programming, data hiding, Overloading and polymorphism.
2. Analyze the data types in C++, object initialization, control structures, loops and methods.
3. Construct C++ program using simple function, friend function, operator overloading and function overloading concept.
4. Implement the concepts of inheritance, virtual function and abstract class.
5. Develop C++ programs using files and templates.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO3** | - | 1 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | - | 2 | 2 | 3 | - | - | - | - | - | - | - | - |
| **CO5** | 1 | 1 | 2 | 3 | 2 | - | - | - | - | - | - | - |

| **08PC406** | **OPERATING SYSTEMS** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce students with basic concepts of operating system, its function and services.
- To understand what a process is and how processes are synchronized and scheduled.
- To teach different approaches to memory management.
- To educate the student to learn about Input /Output and file systems.
- To provide the basic knowledge about UNIX operating system.

**UNIT - I**

Introduction: Introduction to Operating Systems - Review of Computer Organization - Computer System Architectures - Types of Operating System - Operating System Structure - Operating System Service - System Calls - System Programs - System Structure - Layered - Microkernel-Monolithic Operating Systems - Concept of Virtual Machines.

**UNIT - II**

Processes Management: Process Management: Process Scheduling - Multiprocessor and Real-Time Scheduling Algorithms - Process Synchronization-Peterson's Solution-Hardware Support to Process Synchronization-Semaphores-Critical Regions - Monitors – Deadlocks Prevention - Avoidance - Detection and Recovery - Bankers Algorithm – Threads.

**UNIT - III**

Memory Management: Memory management: Background– Swapping–Contiguous Memory Allocation–Paging Segmentation–Segmentation with Paging. Virtual Memory: Back Ground – Demand Paging Process Creation– Page Replacement – Allocation of Frames– Thrashing.

**UNIT - IV**

Input/ Output and File Systems: I/O Management and Disk Scheduling- I/O Devices - Organization of I/O Functions- OS Design Issues-I/O Buffering- Disk Scheduling-Disk Cache. File Management Organization - Directories- File Sharing and Record Blocking- Secondary Storage Management.

**UNIT - V**

Case Study of Unix: UNIX History -Design Principles- Programmer Interface - User Interface - Process Management- Memory Management - File System - I/O System- Inter-process Communication

**Text Books:**

1. Silberschatz, Galvin, and Gagne, "Operating System Concepts", WileyIndia Pvt Ltd, 9th Edition 2013.
2. William Stallings, "Operating Systems – internals and design principles", Prentice Hall, 7thEdition,2011.

**Reference Books:**

1. Andrew S. Tannenbaum, "Modern Operating Systems", Prentice Hall, 4th Edition, 2015.
2. Pramod Chandra P.Bhatt, "An Introduction to Operating Systems Concepts and Practice", Prentice Hall India, 3rd Edition, 2010.
3. Andrew S. Tannenbaum & Albert S. Woodhull, "Operating System Design and implementation", Prentice Hall , 3rd Edition, 2006.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the role of operating system and its services.
2. Explain the concept related with deadlock to solve problem associated with resource allocation and Appreciate role of process synchronization towards increasing throughput of system.
3. Compare the performances of various algorithms used for management of memory, CPU scheduling, file handling and I/O operations.
4. Analyze the design issues of Operating system and IO file systems.
5. Understand the various data structures and algorithm used by Unix operating system pertaining with process, file and I/O management.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - | - |

| **08CP407** | **DATA STRUCTURES AND ALGORITHMS LAB** | **L** | **T** | **P** |
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**Course Objectives:**

- To provide hands-on experience for data structures and design and analysis of algorithm.
- To prepare the students to write programs for understanding the features and concepts of C++ programming language.

## LIST OF EXERCISES

1. Write a C++ program to design a class having static function names show count() which has the property of displaying the number of objects created of the class
2. Write a C++ program to find maximum of two numbers using friend function
3. Write a C++ program using copy constructor to copy data of an object to another object.
4. Write a C++ program to design a class representing complex numbers and having functionality of performing addition and multiplication of two complex numbers using operator overloading
5. Write a C++ program to design a student class representing student roll no. and a teats class (derived class of student) representing the scores of the student in various subjects and sports class representing the score in sports. The sport and test class should be inherited by the result class having the functionality to add the scores and display the final result for the student.
6. Write a C++ program to maintain the records of the person with details (Name and Age) and find the eldest among them. The program must use **this pointer** to return the result.
7. Write a C++ program to illustrate the use of virtual function in a class
8. Write a C++ program showing data conversion between objects of different classes
9. Write a program to create a Stack and perform insertion and deletion operations on it.
10. Write a program to create a List and perform operations such as insert, delete, update and reverse.
11. Write a program to create a Queue and perform operations such as insertion and deletion.
12. Write a program to Implement Linear Search Algorithm
13. Using iteration and recursion concepts write programs for finding the element in the array using the Binary Search method.
14. Write a program and simulate various graph traversing techniques
15. Write a program and simulate various tree traversing techniques
16. Write a program to Implement Binary Search Tree
17. Write a program to simulate Bubble sort, quick sort and Merge sort algorithms

**Course Outcomes:**

At the end of this course, the students will be able to

1. Build, implement linear and tree data structure for implementing and analyzing algorithms to determine their time complexity.
2. Demonstrate C++ language features including pointers, pointer to objects, friend function, function overloading, operator overloading.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 3 | 3 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| 08CP408 | DATABASE MANAGEMENT SYSTEM LAB | L | T | P |
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**Course Objectives:**

- To provide programming knowledge for database management using SQL.
- To train to create simple programs using PL/SQL.

**LIST OF EXERCISES**

1. Implementation of queries for student data base
2. Data Definition Language – with constraint and without constraint
3. Data Manipulation language – Insert, Delete, Update, Select and truncate
4. Transaction Control Statement – Commit, Save point, Roll back
5. Data Control Statement – Grant, Revoke
6. Data Projection Statement – Multi column, alias name, arithmetic operations, distinct records, concatenation, where clause
7. Data Selection Statement – Between, and, not in, like, relational operators and logical operators
8. Aggregate functions – count, maximum, minimum, sum, average, order by, group by, having
9. Joint queries – inner join, outer join, self join, Cartesian join, or cross join
10. Sub queries – in, not in, some, any, all, exist, not exist
11. Set operations – union, union all, intersect, minus
12. Database objects – synonym, sequences, views and index
13. Cursor
14. Functions and procedures
15. Trigger
16. Exceptions
17. Packages
18. Factorial of a number
19. Checking whether a number is prime or not
20. Fibonacci series
21. Reverse the string
22. Swapping of numbers
23. Odd or even number
24. Duplication of records

**Course Outcomes:**

At the end of this course, the students will be able to

1. Select and apply appropriate SQL statements for database management.
2. Analyze and implement simple programs using PL/SQL.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | 3 | - | 2 | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08PC501** | **THEORY OF COMPUTATION** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce and explain the method of constructing Regular Expression, NBA, DFA and Minimal DFA.
- To impart knowledge about types of grammars and eliminate useless symbols, unit and null productions.
- To introduce the concepts of pushdown automata.
- To provide in-depth understanding of Turing machine and its applications.
- To impart knowledge about decidable and undecidable problems.

**UNIT - I**

Finite Automata**:** Introduction- Basic Mathematical Notation and techniques- Finite State systems – Basic Definitions – Finite Automaton – DFA and NDFA – Finite Automaton with €- moves –Regular Languages- Regular Expression – Equivalence of NFA and DFA – Equivalence of NDFA's with and without €-moves – Equivalence of finite Automaton and regular expressions –Minimization of DFA- - Pumping Lemma for Regular sets – Problems based on Pumping Lemma.

**UNIT - II**

Grammars**:** Grammar Introduction– Types of Grammar - Context Free Grammars and Languages– Derivations and Languages – Ambiguity- Relationship between derivation and derivation trees – Simplification of CFG – Elimination of Useless symbols - Unit productions – Null productions – Greibach Normal form – Chomsky normal form – Problems related to CNF and GNF.

**UNIT - III**

Pushdown Automata: Definitions – Moves – Instantaneous descriptions – Deterministic pushdown automata – Equivalence of Pushdown automata and CFL - pumping lemma for CFL – problems based on pumping Lemma.

**UNIT - IV**

Turing Machines : Definitions of Turing machines – Models – Computable languages and functions – Techniques for Turing machine construction – Multi head and Multi tape Turing Machines - The Halting problem – Partial Solvability – Problems about Turing machine-Chomskian hierarchy of languages.

**UNIT - V**

Unsolvable Problems and Computable Functions: Primitive recursive functions –Recursive and recursively enumerable languages – Universal Turing machine. Measuring and Classifying

Complexity: Tractable and Intractable problems-Tractable and possibly intractable problems – P and NP completeness - Polynomial time reductions.

**Text Books:**

1. Hopcroft J.E., Motwani R. and Ullman J.D, "Introduction to Automata Theory, Languages and Computations", Pearson Education, Second Edition, 2008 (UNIT 1, 2, 3).
2. John C Martin, "Introduction to Languages and the Theory of Computation", Tata McGraw Hill Publishing Company, Third Edition, New Delhi, 2007 (UNIT 4, 5).

**Reference Books:**

1. Mishra K L P and Chandrasekaran N, "Theory of Computer Science - Automata, Languages and Computation", Prentice Hall of India, Third Edition, 2004.
2. Harry R Lewis and Christos H Papadimitriou, "Elements of the Theory of Computation", Pearson Education, Second Edition, New Delhi, 2003.
3. Peter Linz, "An Introduction to Formal Language and Automata", Narosa Publishers, Third Edition, New Delhi, 2002.
4. Kamala Krithivasan and Rama. R, "Introduction to Formal Languages, Automata Theory and Computation", Pearson Education, 2009.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Construct NFA, DFA and Minimal DFA.
2. Derive a grammar without useless symbols and obtain CNF and GNF.
3. Construct pushdown automata for a given context free grammar and language.
4. Design a Turing Machine for a given recursively enumerable language.
5. Acquire the knowledge on decidable and undecidable problems.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 1 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |

| **08PC502** | **COMPUTER GRAPHICS AND MULTIMEDIA** | **L** | **T** | **P** |
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**Course Objectives:**

- To make the students to understand the basic concepts of two dimensional and three dimensional graphical structures.
- To provide knowledge about 2D transformations and clipping techniques.
- To impart knowledge about 3D transformations and Open GL programming.
- To demonstrate various aspects of multimedia.
- To impart knowledge on concept of sound, images and videos.

**UNIT - I**

Introduction: Overview of Graphics System – Coordinate Representation – Graphics Output Primitives – Attributes of Graphics Primitives – Implementation Algorithms for Graphics Primitives – Introduction to OpenGL – OpenGL functions for Graphics Primitives.

**UNIT - II**

2D Concepts: 2D Transformations – 2D Viewing – Window Viewport Transformation – Line, Polygon, Curve and Text Clipping Algorithms – OpenGL Functions for 2D Transformations and 2D Viewing.

**UNIT - III**

3D Concepts: 3D Transformations – 3D Viewing – 3D Object Representations – Spline Representation – Visible Surface Detection Methods – Color Models – OpenGL Functions for 3D Transformations and 3D Viewing.

**UNIT - IV**

Multimedia Systems Design: Multimedia Basics − Multimedia Applications − Multimedia System Architecture − Evolving Technologies for Multimedia − Defining Objects for Multimedia Systems − Multimedia Data Interface Standards − Multimedia Databases.

**UNIT - V**

Multimedia File Handling and Hypermedia: Compression and Decompression − Data and File Format Standards − Multimedia I/O Technologies − Digital Voice and Audio − Video Image and Animation − Full Motion Video − Storage and Retrieval Technologies – Multimedia Authoring and User Interface − Hypermedia Messaging.

**Text Books:**

1. Donald D. Hearn, M. Pauline Baker and Warren Carithers, “Computer Graphics with OpenGL”, Fourth Edition, Pearson Education, 2010.
2. Andleigh, P. K and Kiran Thakrar, “Multimedia Systems and Design”, PHI, 2003.

**Reference Books:**

1. Francis S Hill Jr. and Stephen M Kelley, “Computer Graphics Using OpenGL”, Third Edition, Prentice Hall, 2007.
2. Foley, Vandam, Feiner and Huges, “Computer Graphics: Principles and Practice”, Second Edition, Pearson Education, 2003.
3. Ralf Steinmetz and Klara Steinmetz, "Multimedia Computing Communications and Applications", Pearson Education, 2004.
4. Judith Jeffcoate, “Multimedia in practice: Technology and Applications”, PHI, 1998.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand OpenGL functions to create interactive Computer graphics structures.
2. Design OpenGL functions for two dimensional graphics, transformations and clipping algorithms.
3. Build OpenGL functions for three dimensional graphics, transformation and apply color models to graph systems.

4. Analyze and apply design strategies to multimedia systems and multimedia databases.
5. Understand concepts of multimedia file formats and animation technologies.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 1 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - |
| **CO4** | 1 | - | 1 | - | - | - | - | - | - | - | - | 2 |
| **CO5** | 1 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |

| **08PC503** | **SOFTWARE ENGINEERING** | **L** | **T** | **P** |
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**Course Objectives:**

- To impart knowledge on the Software Process Models and Requirement analysis.
- To familiarize the concepts of Architectural Design, component level design, user interface design, pattern based design, web app design and web app interface design.
- To disseminate the knowledge of Software Quality management , Review techniques and Software Quality Assurance.
- To educate Software Configuration Management Repository with its metrics.
- To illustrate the concept of Software Project estimation, Risk Management and Review engineering.

**UNIT - I**

The Software process- A Generic Process Model- Perspective Process Models-Specialized Process Models- The Unified Process-Personal and team process models-Agile Development-Extreme Programming (XP)- Requirements Engineering-Requirements Analysis-Establishing the Groundwork- Eliciting Requirements- Developing Use Cases- Negotiating Requirements- Validating Requirements-Requirements Analysis-Scenario-Based Modeling.

**UNIT - II**

Design concepts-The Design Process-Design Concepts-The Design Model- Architectural Design-Assessing Alternative Architectural Designs- Architectural Mapping Using Data Flow-Component-level design-Designing Class-Based Components-Conducting Component-Level Design-User Interface design-User Interface Analysis and Design- Interface Analysis-Pattern based Design-WebApp design-WebApp Design Quality-WebApp Interface design.

**UNIT - III**

Quality Management- Software Quality- The Software Quality Dilemma- Achieving Software Quality- Review techniques-Cost Impact of Software Defects-Defect Amplification and Removal-Review Metrics and Their Use-Informal Reviews-Formal Technical Reviews-Software Quality Assurance- Test Strategies for Conventional Software-Test Strategies for Object-Oriented Software-SQA Tasks, Goals, and Metrics-Statistical Software Quality Assurance-A Strategic Approach to Software Testing-System Testing-The Art of Debugging.

**UNIT - IV**

Software Configuration Management-The SCM Repository-The SCM Process-Configuration Management for WebApps-A Framework for Product Metrics-Metrics for the Requirements Model-Metrics for the Design Model- Project Management concepts- The management spectrum-People-The Product- The Process-Metrics in the Process and Project Domains.

**UNIT - V**

Software Project Estimation-Decomposition Techniques-Empirical Estimation Models-The Make/Buy Decision-Project Scheduling-Defining a Task Set for the Software Project-Defining a Task Network-Reactive versus Proactive Risk Strategies-Risk Identification-Risk Projection-Risk Refinement-The RMMM Plan-Business Process Reengineering-Software Reengineering-Reverse Engineering-Restructuring-Forward Engineering-The SPI Process-The CMMI-The People CMM-SPI Return on Investment-SPI Trends.

**Text Book:**

1. Roger S. Pressman, "Software Engineering – A Practitioner's Approach", Seventh Edition, Mc Graw-Hill International Edition, 2010.

**Reference Books:**

1. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.
2. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited, 2009.
3. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
4. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
5. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, 2007.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the generic view of Software process models and practices in their appropriate models.
2. Describe the various Design concepts, Design Models that provide the structure of software product.
3. Infer the Software quality management approach for developing the quality products.
4. Determine the need for, and an ability to engage in, Software Configuration management.
5. Acquire the knowledge on Software Project estimation techniques and Software Reengineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | - | 1 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | - | 1 | - | - | - | - | - | - | - | 1 | - |
| **CO4** | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| **CO5** | 1 | - | 1 | - | - | - | - | - | - | - | 1 | - |

| 08PC504 | COMPUTER NETWORKS | L | T | P |
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**Course Objectives:**

- To impart knowledge on layered approach that makes design, implementation and operation of extensive networks possible.
- To teach the components required to build networks.
- To provide basic concepts related to network addressing and routing.
- To make the students to understand the concepts of end-to-end flow of Information and congestion control.
- To familiarize with the concepts of electronic mail, HTTP, DNS and SNMP.

**UNIT - I**

Fundamentals & Link Layer: Building a network – Requirements - Layering and protocols - Internet Architecture – Network software – Performance ; Link layer Services - Framing - Error Detection - Flow control

**UNIT - II**

Media Access & Internetworking**:** Media access control - Ethernet (802.3) - Wireless LANs – 802.11 - Bluetooth - Switching and bridging – Basic Internetworking (IP, CIDR, ARP, DHCP, ICMP)

**UNIT - III**

Routing**:** Routing (RIP, OSPF, metrics) – Switch basics – Global Internet (Areas, BGP, IPv6), Multicast – addresses – multicast routing (DVMRP, PIM)

**UNIT - IV**

Transport Layer**:** Overview of Transport layer - UDP - Reliable byte stream (TCP) - Connection management - Flow control - Retransmission – TCP Congestion control - Congestion avoidance (DECbit, RED) – QoS – Application requirements

**UNIT - V**

Application Layer: Traditional applications -Electronic Mail (SMTP, POP3, IMAP, MIME) – HTTP – Web Services – DNS - SNMP

**Text Book:**

1. Larry L. Peterson, Bruce S. Davie, “Computer Networks: A systems approach”, Fifth Edition, Morgan Kaufmann Publishers, 2011.

**Reference Books:**

1. James F. Kurose, Keith W. Ross, “Computer Networking - A Top-Down Approach Featuring the Internet”, Fifth Edition, Pearson Education, 2009.
2. Nader. F. Mir, “Computer and Communication Networks”, Pearson Prentice Hall Publishers, 2010.
3. Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill Publisher, 2011.

4. Behrouz A. Forouzan, "Data communication and Networking", Fourth Edition, Tata McGrawHill, 2011

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the functions of layering and protocols.
2. Summarize the devices, protocols and standards to design a network.
3. Construct and implement the concept of switching and routing.
4. Select appropriate protocol and techniques related to transport layer in order to maintain consistent flow of information.
5. Illustrate the functions of electronic mail, HTTP, DNS and SNMP.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 1 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 1 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 3 | - | - | - | - | - | - | - | - | - | - |

| **08CP507** | **OPERATING SYSTEMS LAB** | **L** | **T** | **P** |
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**Course Objectives:**

- To prepare the students to write the C programs to understand the concepts of operating system.
- To impart the programming skills in shell programming.

**LIST OF EXERCISES**

1. Job scheduling techniques
2. Disk scheduling techniques
3. Memory allocation techniques
4. Memory management techniques
5. Page replacement techniques
6. Producer consumer problem
7. Bankers algorithm
8. Dining Philosophers problem
9. Write a shell script to perform the file operations using UNIX commands.
10. Write a shell script to perform the operations of basic UNIX utilities.
11. Write a shell script for arrange 'n' numbers using 'awk'.
12. Write a shell script to perform ${}^{n}C_{r}$ calculation using recursion.
13. Write a shell script to sort numbers and alphabetic from a text file using single 'awk' command.
14. Write a Shell script to display all the files which are accessed in the last 10 days and to list all the files in a directory having size less than 3 blocks, greater than 3 blocks and equal to 3 blocks.

15. Write a Shell script to display the numbers between 1 and 9999 in words.
16. Write a Shell script for Palindrome Checking.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Develop the c programs for Job scheduling techniques, Disk scheduling techniques, Memory management techniques and for synchronization problems.
2. Develop Shell script to practice Unix commands and utilities.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO2** | 1 | - | 3 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08CP508** | **COMPUTER GRAPHICS AND MULTIMEDIA LAB** | **L** | **T** | **P** |
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| | | 0 | 0 | 3 |

**Course Objectives:**

- To provide knowledge on implementation of 2D and 3D shape drawing algorithms, transformations and its applications.
- To demonstrate various aspects of image, sound and video editing tools including GIMP, Audacity, Windows Movie Maker, Swish, Flash, etc.

**LIST OF EXERCISES**

1. Implementation of Bresenhams Algorithm – Line and Circle.
2. Implementation of Bresenhams Algorithm – Ellipse.
3. Implementation of Line, Circle and Ellipse attributes.
4. Two Dimensional transformations - Translation, Rotation, Scaling, Reflection, Shear.
5. Cohen Sutherland 2D line clipping and Windowing.
6. Sutherland – Hodgeman Polygon clipping Algorithm.
7. Three dimensional transformations - Translation, Rotation, Scaling.
8. Drawing three dimensional objects and Scenes.
9. Lline DDA, chain of diamonds, chessboard.
10. Generating Fractal images.

**GIMP:**

11. Creating Logos
12. Simple Text Animation

**Audacity:**

13. Silencing,Trimming and Duplicating the Audio signal
14. Giving the Advanced Effect to the Audio Signal

**Windows Movie Maker:**

15. Applying Effect to Video.
16. Creating Titles in Video.

**Swish:**

17. Text Effects.
18. Pre-Loader

**Flash:**

19. Changing the shape of the Object.
20. Imaging Viewing using Mask.

**Photo Impact:**

21. Text Effects.
22. Image Slicin

**Course Outcomes:**

At the end of this course, the students will be able to:

1. Implement 2D and 3D shape drawing algorithms, transformations and its applications.
2. Develop applications on image, sound and video using editing tools including GIMP, Audacity, Windows Movie Maker, Swish, Flash, etc.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 2 | 1 | - | 1 | - | - | - | - | - | - | 1 |
| **CO2** | 1 | 1 | 3 | 1 | 3 | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08PC601** | **SYSTEM SOFTWARE AND COMPILER DESIGN** | **L** | **T** | **P** |
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**Course Objectives:**

- To teach the basics of assembler, loader and linker.
- To explain the design, function and implementation of assemblers, linkers, loaders, macro processors and system software tools.
- To make the student to understand and list the different stages in the process of compilation and Identify different methods of lexical analysis.
- To describe and compare the working principle of top-down and bottom-up parsers.
- To illustrate the algorithms to generate code for a target machine using code optimizer and code generator.

**UNIT - I**

Basics of System Software and Assembler, Loaders And Linkers: Introduction – System software and SIC/XE machine architecture - Basic assembler functions: Assembler algorithms and data structures –

Machine dependent assembler features – Machine independent assembler features. Basic loader functions: Design of an Absolute Loader – A Simple Bootstrap Loader - Machine dependent loader features – Machine independent loader features.

**UNIT - II**

Macro Processors and Other System Software: Basic macro processor functions – Macro Definition and Expansion – Macro Processor Algorithm and data structures – Implementation examples: MASM Macro Processor - Text editors – Overview of Editing Process - User Interface – Editor Structure – Interactive Debugging Systems – Debugging functions and capabilities – Relationships with Other oarts of the system – User Interface Criteria - Virtual Machines.

**UNIT - III**

Compiler - Lexical Analysis: Phases of Compiler - Compiler Construction Tools - Lexical Analysis: Role of a Lexical analyzer - input buffering - specification and recognition of tokens – Finite Automata - Designing a lexical analyzer generator - Pattern matching based on NFA.

**UNIT - IV**

Compiler - Syntax Analysis, Syntax-Directed Translation: Role of Parser - Top-down parsing - recursive descent and predictive parsers (LL) - Bottom-Up parsing - Operator precedence parsing - LR, SLR and LALR parsers - parser generators - syntax-directed translation – S-attributed definition-L-attributed definition.

**UNIT - V**

Compiler- Code Generation, Optimization: Intermediate languages - graphical representations – DAGs - Three address code - types of three address statements - syntax directed translation into three address code - implementation of three address statements - Code Optimization: Machine dependent and machine independent code generation - Sources of optimization - Code Generation - Semantic stacks - evaluation of expressions - control structures and procedure calls.

**Text Books**:

1. Leland Beck, - “System Software – An Introduction to Systems Programming”, Pearson Education, Inc., Third Edition, 2008
2. A.V. Aho, R. Shethi and J. D. Ullman; “Compilers - Principles, Techniques and Tools”, Pearson Education, Second Edition, 2002.

**Reference Books**:

1. D. M. Dhamdhere, "Systems Programming and Operating Systems", Tata McGraw Hill Company, Second Edition, 2009.
2. John J. Donovan, “Systems Programming”, Tata McGraw Hill Company, Second Edition, 2000.
3. V. Raghavan, “Principles of Compiler Design”, Tata McGraw Hill Education Publishers, 2010.
4. Srimanta Pal, “Systems Programming” , Oxford University Press, 2011.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Illustrate the basics of assembler, linker and loader.
2. Understand about macro processors, text editors, debuggers and implement MASM macro processor
3. Explain the process of lexical analysis.

4. Understand the need of parser and compare the principle of top down and bottom up parser.
5. Construct syntax trees and develop algorithms for generating intermediate code.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 1 | 2 | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 1 | 1 | 1 | 1 | - | - | - | - | - | - | - |

| **08PC602** | **PYTHON PROGRAMMING** | **L** | **T** | **P** |
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**Course Objectives:**

- To familiarize with data types, variable, Operators, conditionals and looping.
- To provide in-depth Knowledge and understanding about the Functions.
- To make the students to understand the fundamentals of Classes and Objects.
- To impart the knowledge about File handling and networking.
- To educate the student in Database Management and GUI Programming in Python.

**UNIT - I**

Elementary Programming, Selections and Loops: History of Python – Getting Started with Python – Programming Style – Writing a Simple Program – Reading Input from the Console – Identifiers – Variables, Assignment Statements, and Expressions – Simultaneous Assignments – Named Constants Numeric Data Types and Operators – Type Conversions and Rounding–Introduction – Boolean Types, Values, and Expressions – if Statements – Two-Way if-else Statements – Nested if and Multi-Way if-elif-else Statements – Logical Operators – Conditional Expressions – Operator Precedence and Associativity – Detecting the Location of an Object Case Study: Computing Body Mass Index – The while Loop – The for Loop –Nested Loops – Keywords break and continue – Case Studies: Displaying Prime Numbers and Random Walk.

**UNIT - II**

Mathematical Functions, Strings and User Defined Functions: Simple and Mathematical Python Built–in Functions – Strings and Characters – Introduction to Objects and Methods – Formatting Numbers and Strings – Drawing Various Shapes – Drawing with Colors and Fonts – Defining a Function – Calling a Function –Functions with/without Return Values – Positional and Keyword Arguments –Passing Arguments by Reference Values – Modularizing Code – The Scope of Variables - Default Arguments – Returning Multiple Values –Function Abstraction and Stepwise Refinement – Case Study: Generating Random ASCII Characters.

**UNIT- III**

Classes and Objects: Introduction to Object – Oriented Programming – Basic principles of Object – Oriented Programming in Python – Class definition, Inheritance, Composition, Operator Overloading

and Object creation – Python special UNIT - s – Python Object System – Object representation, Attribute binding, Memory Management, and Special properties of classes including properties, Slots and Private attributes.

**UNIT - IV**

Files, Exception Handling and Network Programming: Introduction –Text Input and Output – File Dialogs – –Exception Handling – Raising Exceptions – Processing Exceptions Using Exception Objects – Defining Custom Exception Classes – Binary IO Using Pickling – Case Studies: Counting Each Letter in a File and Retrieving Data from the Web–Client Server Architecture–sockets – Creating and executing TCP and UDP Client Server UNIT - s – Twisted Framework – FTP – Usenets – Newsgroup – Emails – SMTP – POP3.

**UNIT - V**

Database and GUI Programming: DBM database – SQL database – GUI Programming using Tkinter: Introduction – Getting Started with Tkinter – Processing Events – The Widget Classes – Canvas – The Geometry Managers –Displaying Images – Menus – Popup Menus – Mouse, Key Events, and Bindings –List boxes – Animations – Scrollbars – Standard Dialog Box.

**Text Books:**

1. Mark Lutz, “Learning Python, Powerful OOPs”, O’Reilly, 2011.
2. Guttag, John, “Introduction to Computation and Programming Using Python”, MIT Press, 2013.

**Reference Books:**

1. Jennifer Campbell, Paul Gries, Jason montajo, Greg Wilson, “Practical Programming An Introduction To Computer Science Using Python” The Pragmatic Bookshelf , 2009
2. Wesley J Chun “Core Python Applications Programming”, Prentice Hall, 2012.
3. Mark summerfield “Programming in python 3: A Complete Introduction to Python Language”, Addison Wesley, Pearson Education, 2010.
4. Zelle, John M. “Python Programming: An Introduction to Computer Science”, 1st ed. Franklin Beedle and Associates, 2003.
5. Budd, Timothy, “Exploring Python”, McGraw–Hill Science, 2009.
6. Alex Martelli, “Python in a Nutshell”, O’Reilly Publications, 3rd edition, July 2010.
7. Vernon L. Ceder, “The Quick Python Book”, 2nd Edition, Manning Publications, Jan 2010.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the basic concepts of Conditional and Looping Statements in python programming.
2. Solve large programs in an easy way using Modules concepts.
3. Apply the concepts of Object Oriented programming including encapsulation, inheritance and polymorphism as used in Python.
4. Simulate the commonly used operations in file system and able to develop applications programs to communicate from one end system to another end.
5. Develop menu driven program using GUI interface and to gain knowledge about how to store and retrieve data.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | - | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | 2 | - | - | 1 | - | - | - | - | - | - | - |
| **CO4** | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 1 | 2 | 3 | 1 | 2 | - | - | - | 1 | - | - | 1 |

| **08CP607** | **COMPILER DESIGN AND NETWORK LAB** | **L** | **T** | **P** |
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**Course Objectives:**

- To impart programming knowledge about the different stages of a compiler.
- To explain the aspects of networking and their applications.

**LIST OF EXERCISES**

1. Implementation of Lexical Analyzer for IF Statement.
2. Implementation of Lexical Analyzer for Arithmetic Expression
3. Construction of NFA from Regular Expression
4. Construction of DFA from NFA
5. Implementation of Shift Reduce Parsing Algorithm
6. Implementation of Operator Precedence Parser
7. Implementation of Code Optimization Techniques
8. Implementation of Code Generator
9. Network Primitives.
10. (a) To Find The IP Address of Local Host
    (b) To Find The IP Address of Remote Host
11. Implementation of Echo Server and Client Using TCP Sockets
12. Implementation of Echo Server and Client Using UDP Sockets
13. Send and Receive Message between Client and Server Using TCP
14. Send And Receive Message between Client and Server Using UDP
15. Sliding Window Protocols

**Course Outcomes:**

At the end of this course, the students will be able to

1. Implement different phases of a compiler including lexical analysis, syntax analysis and optimization.
2. Develop programs for implementing network applications.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 2 | - | 2 | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08CP608** | **PYTHON PROGRAMMING LAB** | **L** | **T** | **P** |
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**Course Objectives:**

- To develop the python program for performing variety of programming tasks.
- To impart programming skills for various application using python.

**LIST OF EXERCISES**

1. Python Program to check if a Number is Positive, Negative or Zero.
2. Python program to check prime numbers.
3. Python Program to check Armstrong Number.
4. Python Program to Solve Quadratic Equation.
5. Python Program to Transpose a Matrix.
6. Python Program to Find the Size (Resolution) of Image.
7. Python Program to Display the Multiplication Table using FOR loop.
8. Python Program to Find ASCII Value of Character.
9. Python Program to Convert Decimal to Binary, Octal and Hexadecimal.
10. Python Program to Swap Two Variables Using Function.
11. Python Program to Display Fibonacci Sequence Using Recursion.
12. Python Program to Shuffle Deck of Cards.
13. Python Program to Merge Mails.
14. Python Program to Find Hash of File.
15. Python Program to Root search.
16. Python Program to Solving initial value problem using 4th order Runge-Kutta method.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Solve simple python Programs and understand Object Oriented programming concepts using Python programming.
2. Develop real time applications using Python programming.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | 1 | - | - | - | - | - | - | 1 |
| **CO2** | - | - | 2 | 2 | 1 | - | - | - | 1 | - | - | 2 |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| 00HS701 | ENGINEERING ETHICS | L | T | P |
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**Course Objectives:**

- To provide basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues.
- To disseminate the knowledge about Engineers as responsible Experimenters, Research Ethics, Codes of Ethics, Industrial Standards.
- To inculcate knowledge and exposure on Safety and Risk, Risk Benefit.
- To prepare the students to analyze the Collective Bargaining, Confidentiality, Professional, Employee, Intellectual Property Rights.
- To impart knowledge about MNCs, Business, Environmental, Computer Ethics, Honesty, Moral Leadership, sample Code of Conduct.

**UNIT - I**

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

**UNIT - II**

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study.

**UNIT - III**

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal.

**UNIT - IV**

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) – Discrimination.

**UNIT - V**

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct.

**Text Books:**

1. Govindarajan M, Natarajan S and Senthilkumar V S, "Professional Ethics and Human values", PHI Learning, New Delhi, 2013.
2. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York, 2005.

**Reference Books:**

1. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Thompson Learning, 2000.
2. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, 1999. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, 2003.

3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, 2001.
4. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003).

**Course Outcomes:**

At the end of this course, the students will be able to:

1. Understand the basic knowledge about engineering Ethics, Variety of moral issues and Moral dilemmas, Professional Ideals and Virtues.
2. Describe various social issues, industrial standards, code of ethics and role of professional ethics in engineering field.
3. Analyze responsibilities of an engineer for safety and risk benefit analysis.
4. Understand the professional rights and responsibilities of an engineer.
5. Acquire the knowledge about various roles of engineers in variety of global issues and able to apply ethical principles to resolve situations that arise in their professional lives.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | 1 | 1 | 3 | - | - | - | - |
| **CO2** | 2 | - | - | - | - | 1 | - | 3 | - | - | - | - |
| **CO3** | 1 | - | - | - | - | 2 | - | 3 | - | - | - | - |
| **CO4** | 2 | - | - | - | - | 2 | - | 3 | - | - | - | - |
| **CO5** | 1 | - | - | - | - | 2 | 2 | 3 | - | - | - | - |

| **08PC702** | **SOFT COMPUTING TECHNIQUES** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the fundamentals of various soft computing frameworks including Neural Networks, Fuzzy Systems and Genetic Algorithms.
- To explain the architecture, training and testing algorithms of different types of Artificial Neural Networks.
- To teach the basics of membership functions including fuzzy sets, fuzzy relations and expert systems.
- To familiarize the students with genetic algorithms and their applications.
- To describe the importance and use of various hybrid soft computing techniques including Neuro-fuzzy hybrid systems, Genetic Neuro Hybrid systems and Genetic fuzzy hybrid systems.

**UNIT - I**

Artificial neural network: Introduction, characteristics- learning methods – taxonomy – Evolution of neural networks- basic models - important technologies - Applications. Fuzzy logic: Introduction - Crisp sets- Fuzzy sets - Crisp relations and Fuzzy relations: Cartesian product of relation - Classical relation, Fuzzy relations, Tolerance and Equivalence relations, Non-iterative fuzzy sets. Genetic algorithm- Introduction - Biological background - Traditional optimization and Search techniques - Genetic basic concepts.

**UNIT - II**

ANS and BPN: Network inputs and outputs - Feedback interconnections and network stability - Feed forward networks - Adaptive networks - Supervised and Unsupervised learning - Back Propagation Network – Approach – Operation – Generalized Delta Rule – Update of output – Layer weights – Updates of hidden layer weights – Training data – Network sizing – Weights and Learning Parameters – BPN Applications – Data compression.

**UNIT - III**

Membership functions: Features, Fuzzification, methods of membership value assignments-Defuzzification: Lambda cuts - Methods - Fuzzy arithmetic and fuzzy measures: Fuzzy arithmetic - Extension principle - Fuzzy measures - Measures of fuzziness -Fuzzy integrals - Fuzzy rule base and approximate reasoning : Truth values and tables, Fuzzy propositions, formation of rules-Decomposition of rules, Aggregation of fuzzy rules, Fuzzy reasoning-Fuzzy inference systems-Overview of fuzzy expert system-Fuzzy decision making.

**UNIT - IV**

Genetic algorithm : Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: Inheritance operator, cross over, inversion & deletion, mutation operator, Bitwise operator, Generational Cycle, Convergence of GA, Applications & advances in GA, Differences & similarities between GA & other traditional methods.

**UNIT - V**

Neuro-fuzzy hybrid systems - Genetic Neuro Hybrid systems - Genetic fuzzy hybrid and Fuzzy genetic hybrid systems - Simplified fuzzy ARTMAP - Applications: A fusion approach of Multispectral images with SAR, Optimization of Traveling Salesman Problem using Genetic Algorithm approach, Soft computing based hybrid fuzzy controllers.

**Text Books:**

1. J.S.R.Jang, C.T. Sun and E. Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI / Pearson education 2004.
2. S.N.Sivanandam and S.N.Deepa, "Principles of Soft Computing", Wiley India Pvt Ltd, 2011.

**Reference Books:**

1. S.Rajasekaran and G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis & Applications", Prentice-Hall of India Pvt. Ltd., 2006
2. David E. Goldberg, “Genetic Algorithm in Search, Optimization and Machine Learning” Pearson Education India, 2013
3. James A. Freeman, David M. Skapura, “Neural Networks Algorithms, Applications, and Programming Techniques, Pearson Education India, 1991.
4. George J. Klir, Ute St. Clair, Bo Yuan, “Fuzzy Set Theory: Foundations and Applications” Prentice Hall, 1997.
5. Simon Haykin, “Neural Networks Comprehensive Foundation” Second Edition, Pearson Education, 2005.
6. Jyh-Shing Roger Jang, Chnesy-Tsai Sur & Eiji Miziltazi, "Neuro Fuzzy and Soft computing: A Computational approach to learning and machine intelligence”, Pearson Education, 2004.
7. Melanie Mitchell, “Introduction to Genetic Algorithms”, Prentice Hall of India, 2004.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the basics of Artificial Neural Networks, fuzzy sets and genetic algorithms.
2. Build Neural Network architectures and solve real world problems.
3. Determine membership functions to define the fuzziness in the fuzzy sets and to experiment the decision-making methods to achieve the problem goals.
4. Implement and apply genetic algorithms for problems including creation of Internet search engine.
5. Develop hybrid soft computing models to analyze flood affected areas, optimize travelling salesperson problem and create hybrid fuzzy controllers.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 1 | 1 | 1 | - | - | - | - | - | - | - |

| **08CP706** | **SOFT COMPUTING TECHNIQUES LAB** | **L** | **T** | **P** |
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**Course Objectives:**

- To impart programming skills to implement fuzzy logic concepts.
- To develop the skills required to implement neural networks learning algorithms.

**LIST OF EXERCISES**

1. Performing Union, Intersection and Complement operations.
2. Implementation of De-Morgan's Law.
3. Plotting various membership functions.
4. Fuzzy toolbox to model tip value.
5. Implementation of FIS Editor.
6. Simple addition and subtraction of fuzzy sets.
7. To find the weight matrix.
8. Generation of ANDNOT function using McCulloch-Pitts neural net.
9. Classification of two dimensional input patterns in bipolar in Hebb Net.
10. Perceptron net for an AND function with bipolar inputs and targets.
11. Calculate the weights using hetero-associative neural net for mapping of vectors.
12. XOR function (binary input and output) using back propagation algorithm.

**Course Outcomes :**

At the end of this course, the students will be able to

1. Develop programs for Fuzzy set operations and to create Fuzzy Inference System.
2. Design neural network models including McCulloch - Pitts net, Hebb net ,Perceptron net, Hetero-associative net and Back Propagation net.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08ST708** | **SEMINAR / INDUSTRIAL TRAINING** | **L** | **T** | **P** |
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## Course objectives:

- To expose the students to understand technical and professional skill requirements in IT industries.
- To impart professional skills for solving problems in industries.
- To train the students to design innovative solutions for a problem.
- To motivate the students to become an Entrepreneur.
- To develop communication and technical report writing skill.

## Course outcomes:

At the end of this course, the students will be able to

1. Understand the day-to-day job in IT industries, and technical and professional skills needed for an industry.
2. Develop and refine technical and professional skills through hands-on work experience.
3. Design an innovative solution for an Industry requirement by applying the knowledge learned from industry and in academics.
4. Develop a startup for product or services based on the people or industry requirements.
5. Communicate effectively the knowledge learned in internship through document and PowerPoint presentation.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | 2 | 2 | - | - | - | - | - | - | - | - | 3 |
| **CO3** | 1 | - | 2 | 1 | 2 | - | - | - | - | - | - | - |
| **CO4** | 1 | - | - | - | - | - | - | - | 2 | - | 2 | 1 |
| **CO5** | 1 | - | - | - | 2 | - | - | - | - | 3 | - | - |

| 08PV803 | PROJECT WORK AND VIVA VOCE | L | T | P |
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**Course Objectives:**

- To inculcate the ability to identify the problem and is objective.
- To guide the students to review literatures based on the problem statement.
- To teach the students to design the block diagram of the proposed work.
- To train the students to do the experiments and analyse the results.
- To develop communication and technical report writing skills.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand and articulate problem statement and identify the objectives of the project.
2. Review the state-of-the-art literature on the topic of the proposed work.
3. Design the methodology of the work in terms of block diagram.
4. Design experiments and conduct investigations of the work using modern IT tools and infer the results in graph, table and charts.
5. Communicate effectively through technical report and PowerPoint presentation.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 3 | - | - | - | - | - | - | 3 | - | 3 | - |
| **CO2** | 1 | 2 | - | - | - | - | - | - | 3 | - | 3 | 3 |
| **CO3** | 1 | - | 2 | - | - | - | - | - | 3 | - | 3 | - |
| **CO4** | 1 | - | 2 | 2 | 2 | - | - | - | 3 | - | 3 | - |
| **CO5** | 1 | - | - | - | - | - | - | - | 3 | 3 | 3 | 3 |

# PE - PROFESSIONAL ELECTIVES

| 08PExxx | WEB DESIGN | L | T | P |
|---|---|---|---|---|
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**Course Objectives:**

- To understand the concept of static web designing using HTML
- To understand the concept of dynamic web designing using Java Script and XML
- To understand the concept of server-side web designing using PHP
- To understand the concept of server-side web designing using C#
- To understand the concept of server-side web designing using VB and Java

**UNIT - I**

HTML: Introduction to Internet - Introduction to HTML5 - Cascading Style Sheets - Canvas – Web Sockets and Web Workers.

**UNIT - II**

Java Script: Introduction to Scripting - Control Statements – Functions - Arrays - Objects - Event Handling.

**UNIT - III**

Dynamic Web Design: XML - Ajax-Enabled Rich Internet Applications with XML and JSON - Web Servers (Apache and IIS) - Database: SQL, MySQL, LINQ and Java DB .

**UNIT - IV**

Server-Side Scripting with PHP and C#: PHP - Web App Development with ASP.NET in C# - Web Services in C#.

**UNIT - V**

Server-Side Scripting with VB and Java: Web App Development with ASP.NET in Visual Basic - Web Services in Visual Basic - JavaServerTM Faces Web Apps - Web Services in Java .

**Text Books:**

1. Paul Deitel, Harvey Deitel, and Abbey Deitel, “Internet and World Wide Web How to Program”, Pearson education, 3rd Edition ,2012.
2. Robin Nixon, “Learning PHP, MySQL, JavaScript, CSS & HTML5”, O'Reilly Meia, 5th Edition, 2014.

**Reference Books**:

1. Jon Duckett, “Beginning Html, Xhtml, Css, and Javascript”, Wiley India Pvt Ltd, 2009.
2. Jennifer Niederst Robbins, “Learning Web Designn ( A Beginner's Guide to HTML, CSS, JavaScript and Web Graphics)”, O'Reilly Media, 4th Edition, 2012 .
3. Jon Duckett, “Web Design with HTML, CSS, JavaScript and jQuery Set”, Wiley India Pvt Ltd, 2014.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Discuss the important components of HTML and can create stylish web pages using CSS.
2. Develop simple programs for web page designing using Java Script.

3. Interpret the standard format for data exchange between applications over the Internet using XML.
4. Build programs that can interact with MYSQL database and create data-driven web applications using ASP.NET in Visual Basic.
5. Develop web application development using ASP.NET in Visual Basic.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 1 | 1 | 1 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | 1 | 1 | - | 2 | - | - | - | - | - | - | - |
| **CO4** | 1 | 1 | 1 | - | 2 | - | - | - | - | - | - | - |
| **CO5** | 1 | 1 | - | - | 2 | - | - | - | - | - | - | 1 |

| **08PExxx** | **PERL PROGRAMMING** | **L** | **T** | **P** |
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**Course Objectives:**

- To provide the basic features of Perl language.
- To explain the concept of lists, arrays and hashes.
- To impart programming skills for handling files.
- To demonstrate the usage of subroutines and units.
- To introduce regular expression for processing text.

**UNIT - I**

An overview of Perl: Getting started, Scalar data – Numbers – Strings – Built-in warnings - Operators – Variables – Output with print – Control structures – Getting user input – More control structures.

**UNIT - II**

Lists and Hashes: Introduction to lists, Simple lists, Complex lists, Accessing list values, List slices, Ranges, Combining ranges and Slices. Arrays – Accessing single and Multiple elements from an array Interpolating Arrays into Strings – For Control Structure – Array functions (pop, push, shift, unshift, and sort) – Array manipulations; Introduction to Hashes – Hash element access – Hash functions – Typical use of hash.

**UNIT - III**

Files and Data: Input from standard input – Diamond operator – Invocation Arguments – Standard Output – Formatted Output using printf – File Handles – Opening a file handle – Fatal errors – Using file handle – Reopening a standard file handle – Output with say – File handles in a scalar.

**UNIT - IV**

Subroutines and UNIT - s: Introduction to subroutines – Defining – Invoking – Return Values – Arguments – Private variables – Variable length parameter list – Lexical variables – Use strict pragma – Return operator – Non-scalar return values – Perl UNIT - s – Finding and Installing UNIT - s –

Using simple UNIT - s-CGI.

**UNIT - V**

Regular Expressions: Introduction to regular expressions- Simple patterns – Character classes – Matching with regular expression – Processing text with regular expression – Substitutions – Split operator – Join function.

**Text Books:**

1. Stephen Spainhour, Ellen Siever, Nathan Patwardhan," Perl in a Nutshell", O'Reilly Media Publications,1998.
2. Simon Cozens, Peter Wain Wrigth, "Beginning Perl", Wrox press, First Edition, 2000.

**Reference Books:**

1. Tom Christiansen, Brian D Foy, Larry Wall, Jon Orwant, "Programming Perl", O'Reilly Media, Fourth Edition, 2012.
2. Randal L. Schwartz, Brian D Foy, Tom Phoenix, "Learning Perl", O'Reilly Media, Sixth Edition, 2011.
3. Ellie Quigley, "Perl by Example", Prentice Hall, Fifth Edition, 2014.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Apply basic programming concepts of Perl language.
2. Develop Perl programs using arrays, lists and hashes.
3. Create Perl programs that make use of directories and files.
4. Define and call subroutines with return values, arguments, private variables and variable length parameter list.
5. Illustrate matching, replacing and splitting operations in text using regular expressions.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| **COl** | 1 | 2 | l | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 1 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |

| **08PExxx** | **VISUAL PROGRAMMING** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce about .NET environment and event programming concepts.
- To familiarize with the basic data types and looping structure of VB.NET.
- To describe properties methods and events of controls in VB.NET.
- To impart programming skills on object oriented concepts and exception handling.
- To inculcate the concepts of XML Web Service and ADO.NET.

**UNIT - I**

Visual Basic fundamentals : Basic .NET Concepts- Exploring the Development Environment- Creating a Visual Basic .NET Project- Event-driven programming- classes- objects- properties- methods- events- Message Box function- multiple forms

**UNIT - II**

Programming with .NET: Introduction to Data Types- Using Variables- Variable Scope- Converting Data Types- Creating and Using Structures- Storing Data in Arrays- Conditional Expressions- Using Decision Structures- Using Conditional Loop Structures- Restricting User Input- Validating Field Data- Validating Form Data- Built-In Functions- Mathematical and String Functions- User Defined Functions and Procedures.

**UNIT - III**

Programming with controls: Properties, Events and Methods of Form, Label, Textbox, List Box, Combo Box, Radio Button, Button, Check Box, Progress Bar, Date Time Picker, Calendar, Picture Box, Scrollbar, VScrollBar, Group Box, Tooltip, Timer. Creating MDI Parent and Child

**UNIT - IV**

Object orientation with .Net: Understanding Classes- Working with Classes- Using Shared Members- Inheritance- Polymorphism- Namespaces- Types of Errors- Using the Debugger- Handling Exceptions- Creating Menus- Creating Status Bars- Creating Toolbars

**UNIT - V**

Advance concepts: Working with Web Forms- Using XML Web Service- Database Concepts- Overview of ADO.NET- Working with Data- Introduction to Deployment- Deploying a Windows-based Application

**Text Books:**

1. Steven Holzner, “Visual Basic.Net Black Book”, Dreamtech Press, 2009.
2. Jeffery R. Shapiro, “The Complete Reference Visual Basic .NET”, Tata McGraw Hills, 2009.

**Reference Book:**

1. Anne Prince, “Murach’s Beginning Visual basic .Net”, Mike Murach & Associates, Incorporated, 2002.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Analyze the .NET environment and event programming concepts.
2. Make use of the basic data types and looping structure of VB.NET.
3. Experiment with the properties and controls in VB.NET.
4. Develop program on object oriented concepts and exception handling.
5. Design an application on the concepts of XML Web Service and ADO.NET.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **COl** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 2 | 2 | - | - | - | - | 1 | - | - | - |
| **CO5** | 1 | 1 | 2 | 2 | - | - | - | - | 1 | - | - | - |

| **08PExxx** | **JAVA PROGRAMMING** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the fundamentals of OOPs including auto boxing, generics and wrapped classes.
- To familiarize with interfaces, inheritance and packages.
- To expose the concepts of multithreading and exception handling.
- To enable the students to understand Applets, Swings, and Event Handling.
- To develop the skills required for networking, JDBC, Servlets, and RMI.

**UNIT - I**

Review of OOP concepts: Encapsulation, Inheritance, Polymorphism, Classes, Objects, Constructors, Methods, Parameter passing, Static fields and Methods, Access Control, This reference, Overloading methods and Constructors, Recursion, Garbage Collection, Building strings, Exploring string class, Enumerations, Autoboxing and Unboxing, Generics.

Java Basics: History of Java, Comments, Data Types, Variables, Constants, Variables, Operators, Control Statements, Looping Statements, Type Conversion and Casting, Enumerated Types, Arrays, Classes and Objects, Fields and Methods, Constructors, Overloading Methods, Garbage Collection, Nested classes, Methods and Constructors and Wrapped classes.

**UNIT - II**

Inheritance: Inheritance Concept, Benefits of Inheritance, Super Classes and Sub Classes, Member access rules, Inheritance hierarchies, Final classes and Methods, Casting, Polymorphism– Dynamic Binding, Method Overriding, Abstract classes and Methods. Interfaces – Interfaces vs. Abstract classes, Defining an interface, Implementing Interfaces, Accessing implementations through interface references, Extending interface. Inner classes – Uses of Inner classes, Local Inner classes, Anonymous Inner classes, Static Inner classes.

Packages: Defining, Creating and Accessing a user defined packages, Understanding CLASS PATH, Importing own packages.

**UNIT - III**

Multithreading: Differences between Multiple processes and Multiple threads, Thread states, Creating threads, Interrupting threads, Thread priorities, Synchronizing threads, Interthread Communication, Thread groups, Daemon threads.

Exception Handling: Dealing with errors, Benefits of exception handling, The classification of

Exceptions – Exception Hierarchy, Checked Exceptions and Unchecked Exceptions, Usage of try, Catch, Throw, Throws and Finally, Rethrowing Exceptions, Exception Specification, Built in Exceptions, Creating own exception sub classes.

**UNIT - IV**

Applets: Inheritance hierarchy for applets, Differences between Applets and Applications, Life cycle of an applets – Four methods of an Applets, Developing Applets and Testing, Passing parameters to Applets, Applet security issues, Java's Graphics capabilities – Introduction, Graphics contexts and Graphics objects, Colour control, Font control, Drawing lines, Rectangles, Ovals and Drawing arcs.

Swings: The AWT class hierarchy, Introduction to Swing, Swing vs. AWT, MVC architecture, Hierarchy for Swing components, Containers – Top-level containers – JFrame, JApplet, JWindow, JDialog, Light weight containers – JPanel, Jbutton, JToggleButton, JCheckBox, JRadioButton, JLabel, JTextField, JTextArea, JList, JComboBox, JMenu, Layout management – Layout types – border, grid, flow and box.

Event Handling – Event sources, Event classes, Event Listeners, Relationship between Event sources and Listeners, Delegation event model, Semantic and Low–level events.

**UNIT - V**

Networking: Introduction - Manipulating URLs - Client/Server Interaction with Stream Socket Connections - Connectionless Client/Server Interaction with Datagram.

JDBC: The connectivity Model – JDBC/ODBC Bridge – Java. SQL package – Connectivity to remote database – Navigating through multiple rows retrieved from a database.

Servlets: Introduction - Life cycle of Servlet - Java Servlet Development Kit - Javax.servlet package - Reading Servlet Parameters - Reading Initialization Parameters. RMI: RMI Architecture - Designing RMI application Executing RMI application

**Text Books:**

1. Herbert Schildt, "Java The complete reference", TMH, 8th Edition, 2011.
2. P.J.Deitel and H.M.Deitel, "Java How to Program", TMH, 8th Edition, 2014.

**Reference Books:**

1. D.S.Malik, "Java Programming", Cengage Learning, 5th Edition, 2012.
2. Cay S.Horstmann and Gary Cornell, "Core Java ", Pearson Education, 8th Edition, 2013.
3. K.Somasundaram, "Advanced Programming in Java2", Jaico Publishing House,2012.
4. S.Malhotra and S.Choudhary, "Programming in Java", Oxford Univ. Press, 2011.
5. R.Buyya, S.T.Selvi, X.Chu, "Object Oriented Program with Java", TMH, 8th Edition, 2011.
6. Jason Hunter, "Java Servlet Programming", O'Reilly, 2nd Edition,2001.
7. William Grosso, "Java RMI", First Edition,2002.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Explain the fundamentals of OOP including auto boxing, generics and wrapped classes.
2. Design applications involving interfaces, inheritance and packages.
3. Build programs on the concepts of multithreading and exception handling.
4. Demonstrate the working of Applets, Swings, and Event Handling.
5. Construct the applications involving networking, JDBC, Servlets, and RMI.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| **COl** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 1 | 3 | 1 | - | - | - | - | - | - | - | - |

| **08PExxx** | **REAL TIME SYSTEMS** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the basic fundamental problems, concepts, and approaches in the design and analysis of real-time systems.
- To explain the issues related to the design and analysis of systems with real-time constraints.
- To teach the real time applications and their functional semantics.
- To motivate comprehensive ideas about various issues in real time systems.
- To develop the skills required on real time system programming and programming tools.

**UNIT - I**

Introduction: Issues in Real-Time computing - structure of a Real-time system - task classes - Characterization of Real-Time systems and tasks - performance measures of real-time systems - Estimation of Program Run Times - Real-Time Specification and Design Techniques - Real Time Applications : Digital control systems, High level control systems, Signal processing and Multimedia applications.

**UNIT - II**

Task Assignment and Scheduling: Classical Uni-processor scheduling Algorithms - Clock-driven approach, weighted round robin approach, Priority driven approach, dynamic versus static systems, Effective release times and deadlines, Optimality of EDF and LST algorithms, Challenges in validating timing constraints in priority driven systems, Offline versus online scheduling. Task Assignment - Mode Changes - Fault Tolerant Scheduling.

**UNIT - III**

Real-Time Communication: Network topologies - Protocols - Real-Time Databases: Introduction - Real Time vs. General Purpose Database - Main memory Databases - Transaction Priorities and Aborts - Concurrency control issues, Disk Scheduling Algorithms, Two-phase approach to improve predictability, serialization consistency, Databases for Hard Real-Time systems - Fault Tolerance Techniques - Fault Types, Fault Detection - Fault Error containment Redundancy, Data Diversity, Reversal Checks, Integrated Failure handling.

**UNIT - IV**

Real-time Memory Management: Process Stack Management - Dynamic Allocation - Resources and Resource Access Control : Assumptions on resources and their usage, effects of resource contention and resource access control - basic priority-inheritance protocol, basic priority-ceiling protocol - Real- time Kernels: Polled loop Systems - Phase/State-Driven Code - Co-routines - Interrupt Driven Systems - Foreground/Background Systems - Capabilities of commercial real-time operating systems, Predictability of general-purpose operating systems - Full-Featured Real-time Operating Systems.

**UNIT - V**

Programming Languages and Tools: Desired language characteristics, Data typing, control structures, Facilitating hierarchical decomposition, packages, Run-Time error (exception) handling, overloading and generics - Multitasking, Low-level programming, Task scheduling - Timing specifications, Run-time support, Programming environments.

**Text Books:**

1. C.M.Krishna and Kang G. Shin, “Real-Time Systems”, Tata McGraw Hill, 2010.
2. Philip.A.Laplante, “Real Time Systems Design and Analysis”, 3/e, Wiley-IEEE Press, 2004.

**Reference Books:**

1. Jane W.Liu, "Real-Time Systems", Pearson Education, 2001.
2. Alan Burns Andy Wellings, “Real Time systems and their programming languages”, Fourth edition, Addison Wesley, 2009.
3. C.Sivamurthy and G.Manimaran, “Resource Management in Real-time Systems and Networks”, Prentice Hall of India, 2005.
4. Rajib Mall, "Real-Time Systems: Theory and Practice," Pearson, 2008.
5. Alan C. Shaw, “Real-Time Systems and Software”, Wiley, 2001.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand real time computing, its characteristics and performance measures.
2. Design Task Assignment and Scheduling algorithms for real time systems.
3. Characterize various real-time approaches for concurrency and fault tolerance issues.
4. Analyze various real time system memory management issues.
5. Apply formal software engineering methods, programming tools and practices to design, analyze and develop small real-time systems.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | - | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 1 | - | 1 | - | - | - | - | - | - | - | - | - |
| **CO5** | 1 | 1 | - | - | 2 | - | - | - | 2 | - | - | 1 |

| 08PExxx | MOBILE COMPUTING | L | T | P |
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| | | 4 | 0 | 0 |

**Course Objectives:**

- To introduce the basic concepts of mobile computing.
- To impact Knowledge about Medium access control protocol.
- To provide basic knowledge of GSM,DECT and FETRA
- To familiarize the basic properties and concepts of mobile ad-hoc networks, Bluetooth and HIPERLAN.
- To explain about mobile IP, mobile TCP and wireless Application Protocol (WAP).

**UNIT - I**

Mobile Computing Vs wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application. need and types of multiplexing techniques - modulation types - use of spread spectrum - cellular Systems.

**UNIT - II**

Motivation for a specialized MAC –SDMA–FDMA– TDMA–CDMA and comparison of these methods.

**UNIT - III**

GSM : mobile services - system architecture - radio interface – protocols - localization and calling - handover – security - new data services – DECT : system and protocol architecture – TETRA.

**UNIT - IV**

Introduction - Infrared vs. radio transmission - Infrastructure and ad-hoc networks - IEEE 802.11: system and protocol architecture - physical and MAC layer – HIPERLAN : protocol architecture - physical layer and MAC sub layer - Bluetooth : physical and MAC layer.

**UNIT - V**

Mobile IP – Dynamic host configuration protocol – Ad- hoc networks -- Mobile transport layer – Traditional TCP – Indirect TCP - Snooping TCP - Mobile TCP - Wireless Application Protocol – architecture - datagram protocol - transport layer security – Transaction and session protocol

**Text Books:**

1. Jachen Schiller, “Mobile Communications”, Addison, Wesley, 2014.
2. Prasant Kumar Pattnaik, Rajib Mall, “Fundamentals of Mobile Computing”, PHI Learning Pvt. Ltd, New Delhi, 2012.

**Reference Books:**

1. Reza B, Far, “Mobile Computing Principles:, Designing And Developing Mobile Application With UML and XML”, Cambridge University Press, 2005.
2. William C.Y.Lee, “Mobile Communication Design Fundamentals”, John Wiley, 2010.
3. William Stallings, “Wireless Communications and Networks”, Pearson Education, 2009.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire the basic concepts in mobile computing.
2. Understand the concept of Medium access control protocol.

3. Analyze the GSM,DECT and TETRA
4. Implement Blue tooth and HIPERLAN uses in ad-hoc networks
5. Understand the concepts of Mobile IP, mobile TCP and wireless Application Protocol (WAP).

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 2 | - | 1 | - | - | - | 1 | - | - | - |
| **CO3** | 2 | - | 2 | - | 1 | - | - | - | 1 | - | - | 1 |
| **CO4** | 2 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO5** | 2 | - | - | - | 1 | - | - | - | 1 | - | - | - |

| **08PExxx** | **MOBILE APP DEVELOPMENT** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the fundamentals of Android operating system and its environment.
- To familiarize with the user interface concepts including layouts, fragments and activities.
- To teach the concepts of intents and broadcasts receivers.
- To educate how to share preferences and access SQLite databases.
- To develop the skills required to create alarms and map-based activities using Geocoder.

**UNIT - I**

Android: An Open Platform for Mobile Development - Native Android Applications - Android SDK features - Understanding the Android Software Stack - The Dalvik Virtual Machine - Android Application Architecture - Android Libraries - Creating the Android Application - Types of Android Applications - Android Development Tools - Externalizing the Resources - The Android Application Lifecycle

**UNIT - II**

Building User Interface: Fundamental Android UI design - Android User Interface fundamentals - Layouts - Linear - Relative - Grid Layouts - Fragments - Creating new fragments - The Fragments Lifecycle -Introducing the Fragment Manager - Adding Fragments to Activities - Interfacing between Fragments and Activities.

**UNIT - III**

Intents And Broadcasts Receivers: Introducing Intents - Using intents to launch Activities - Introducing Linkify - Using Intents to Broadcast Events - Introducing the Local Broadcast Manager Introducing pending intents - Using Intent filters to service implicit Intents - Using Intent Filters for Plug-Iins and extensibility - Listening for Native Broadcast Intents - Monitoring Device State Changes Using Broadcast Intents.

**UNIT - IV**

Files , Saving State And Preferences: Saving Simple Application Data - creating and Saving Shared Preferences - Retrieving Shared Preferences – Introducing the Preference Framework and the Preference Activity – Working with the File System – Introducing Android Databases - Introducing SQLite – Content Values and Cursors – Working with SQLite Databases - Creating Content Providers, Using Content Providers.

**UNIT - V**

Advanced Topics: Alarms - Creating and using alarms - Using Location Based Services – Using the Emulator with Location-Based Services - Finding the Current Location – Using the Geocoder - Creating Map-Based Activities.

**Text Books:**

1. Reto Meier, "Professional Android 4 Application Development", John Wiley & Sons, Inc, India, (Wrox) , 4th Edition, 2012.
2. Android Application Development for Java Programmers, James C Sheusi, Course Technology Cengage Learning, 1st Edition, 2013

**Reference Books:**

1. Wei-Meng Lee , "Beginning Android 4 Application Development", Wiley India (Wrox), 2013
2. Wei – Meng Lee," Beginning Android Application Development", Wiley, 2011
3. Charlie Collins, Michael Galpin and Matthias Kappler, "Android in Practice", Dream Tech., 2012

**Course Outcomes:**

At the end of this course, the students will be able to

1. Infer the fundamentals of Android operating system and its environment.
2. Analyze the user interface concepts including layouts, fragments and activities.
3. Examine the concepts of intents and broadcasts receivers.
4. Build applications involving share preferences and SQLite databases.
5. Design and develop applications using alarms and Geocoder.

| **Mapping of Course Outcomes with Programme Outcomes** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 1 | 1 | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 1 | - | 1 | - | - | - | - | - | - | - |
| **COl** | 3 | 1 | 1 | - | 1 | - | - | - | - | - | - | - |
| **CO4** | 3 | 2 | 1 | 2 | 2 | - | - | - | 1 | - | - | 1 |
| **CO5** | 2 | 2 | 1 | 2 | 2 | - | - | - | 1 | - | - | 1 |

| 08PExxx | SOFTWARE TESTING AND QUALITY ASSURANCE | L | T | P |
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**Course Objectives:**

- To impart knowledge on various phases of software project.
- To facilitate knowledge on various software testing techniques and different levels of testing.
- To disseminate the knowledge on planning and managing test process and to explain about Performance testing and Regression testing.
- To introduce the basic concepts of SQA standards and components of SQA system.
- To explain the components of quality plan for software projects, verification, validation and qualification.

**UNIT - I**

Phases of Software project – Quality, Quality assurance and quality control – Testing, Verification and Validation – White box testing – Static testing – Structural testing – Black box testing – Definition, need for black box testing – Black box testing techniques - Requirements based testing, Positive and Negative testing, Boundary Value Analysis, Decision Tables, Equivalence Partitioning, Graph based Testing, Compatibility Testing, Domain Testing.

**UNIT - II**

Integration testing - Integration testing as a type of testing - Integration testing as a phase of testing – Scenario testing – Defect bash - System and Acceptance testing – System testing overview – Need for System testing – Functional system testing – Non-functional testing – Acceptance testing.

**UNIT - III**

Performance testing – Factors governing performance testing – Methodology for performance testing – Tools for performance testing – Process for performance testing – Regression testing – Types of Regression testing – When and how to do Regression testing – Test planning – Test management – Test process – Test reporting.

**UNIT - IV**

Software quality – definition - Software quality assurance – definition and objectives - Software quality assurance and software engineering - Software quality factors - The components of the software quality assurance system – The SQA system - SQA architecture Pre-project components - Software project life cycle components - Infrastructure components for error prevention and improvement - Management SQA components - SQA standards, system certification, and assessment components - Organizing for SQA – The human components - Considerations guiding construction of an organization's SQA system.

**UNIT - V**

Development plan and quality plan objectives - Elements of the development plan - Elements of the quality plan - Development and quality plans for small projects and for internal projects - Integrating quality activities in the project life cycle - Classic and other software development methodologies - Factors affecting intensity of quality assurance activities in the development process - Verification, validation and qualification - A model for SQA defect removal effectiveness and cost.

**Text Books:**

1. Srinivasan Desikan, Gopalaswamy Ramesh, "Software Testing: Principles and Practices", Pearson Education India, 1st Edition, 2005.
2. Daniel Galin, "Software quality assurance – from theory to implementation", Pearson Education India, 1st Edition, 2009.

**Reference Books:**

1. Aditya Mathur, "Foundations of software testing", Pearson Education, 1st Edition, 2008.
2. Ron Patton, "Software Testing", Pearson education, 2nd Edition, 2007.
3. William E. Perry, "Effective Methods for Software Testing: Includes Complete Guidelines, Checklists, and Templates", Wiley Publishing, 3rd Edition, 2006.
4. Alan C Gillies, "Software Quality Theory and Management", Cengage Learning, 2nd Edition, 2003.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand phases of software project and various software testing techniques.
2. Implement integration and acceptance testing methods for quality improvement of the project.
3. Apply performance and regression testing strategies for developing the quality projects.
4. Analyze components of software quality assurance and apply it for construction of an organization's SQA system.
5. Design and develop quality plans for internal projects.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | - | 1 | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | 1 | - | - | 1 | - | - | - | - | - | - | - |
| **CO4** | 1 | - | 2 | 1 | - | - | - | - | - | - | 1 | - |
| **CO5** | 2 | - | 1 | 1 | - | - | - | - | - | - | 1 | - |

| **08PExxx** | **DISTRIBUTED SYSTEMS** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the basic Concepts of Distributed systems.
- To impact Knowledge about Inter Process Communication and network Virtualization.
- To provide basic Knowledge of Peer to peer systems and distributed file system.
- To familiarize the basic properties and concepts of Clocks, events and Process states.
- To demonstrate process migration features, threats and Task assignment approach.

**UNIT - I**

Introduction – Examples of Distributed System – Trends in Distributed System – Focus on resource sharing – Challenges – Case study: World Wide Web – System Model – Physical models – Architectural models – Fundamental models.

**UNIT - II**

System Model – Inter process Communication – the API for internet protocols – External data representation and Multicast communication. Network virtualization: Overlay networks. Case study: MPI Remote Method Invocation and Objects: Remote Invocation – Introduction – Request – reply protocols - Remote procedure call – Remote method invocation. Case study: Java RMI – Group communication – Publish – subscribe systems – Message queues – Shared memory approaches – Distributed objects – Case study: Enterprise Java Beans – from objects to components.

**UNIT - III**

Peer to peer Systems – Introduction – Napster and its legacy – Peer to peer – Middleware –Routing overlays. Overlay case studies: Pastry, Tapestry – Distributed File Systems – Introduction – File service architecture – Andrew File system. File System: Features - File model – File accessing models File sharing semantics Naming: Identifiers, Addresses, Name Resolution – Name Space Implementation – Name Caches – LDAP.

**UNIT - IV**

Introduction – Clocks, events and process states – Synchronizing physical clocks – Logical time and logical clocks – Global states – Coordination and Agreement – Introduction – Distributed mutual exclusion – Elections Transactions and Concurrency Control – Transactions – Nested transactions – Locks – Optimistic concurrency control – Timestamp ordering – Atomic Commit protocols - Distributed deadlocks – Replication – Case study – Coda.

**UNIT - V**

Process Management: Process Migration: Features, Mechanism – Threads: Models, Issues, Implementation. Resource Management: Introduction – Features of Scheduling Algorithms – Task Assignment Approach – Load Balancing Approach – Load Sharing Approach.

**Text Books:**

1. George Coulouris, Jean Dollimore and Tim Kindberg, “Distributed Systems Concepts and Design”, Fifth Edition, Pearson Education, 2012.
2. Pradeep K Sinha, “Distributed Operating Systems: Concepts and Design”, Prentice Hall of India, 2007.

**Reference Books:**

1. Tanenbaum A.S., Van Steen M., “Distributed Systems: Principles and Paradigms”, Pearson Education, 2007.
2. Liu M.L., “Distributed Computing, Principles and Applications”, Pearson Education, 2004.
3. Nancy A Lynch, “Distributed Algorithms”, Morgan Kaufman Publishers, USA, 2003.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire the basic Concepts in Distributed System.
2. Understand the concepts of API for Internet protocols, MPI Remote Method, Invocation and JAVA RMI.
3. Analyze Peer to Peer Systems and Distributed file systems.
4. Implement logical time and logical Clocks using Synchronizing physical Clocks.
5. Understand the concepts of process management.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 1 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 1 | - | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | - | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO5** | 1 | - | - | - | - | - | - | - | - | - | - | - |

| **08PExxx** | **NETWORK SECURITY** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the concepts Computer Security and Cryptography.
- To familiarize the Symmetric Key Algorithms and AES.
- To illustrate the concepts of Asymmetric Key Algorithms- Digital Signatures and RSA.
- To explain the Digital Certificates and Public Key Infrastructure.
- To impart knowledge on Network Security, Firewalls and Virtual Private Networks and Internet Security Protocols.

**UNIT - I**

Introduction - Need for security -Principles of Security - Types of Attacks - Plain text and Cipher Text Substitution techniques- Caesar Cipher- Mono alphabetic Cipher- Polygram- Polyalphabetic Substitution- Play air- Hill Cipher- Transposition techniques- Encryption and Decryption- Symmetric and Asymmetric Key Cryptography- Steganography- Key Range and Key Size-Possible Types of Attacks.

**UNIT - II**

Algorithms types and modes- Overview of Symmetric key Cryptography- Data Encryption Standard (DES)- International Data Encryption Algorithm (IDEA)- RC4- RC5- Blowfish- Advanced Encryption Standard (AES).

**UNIT - III**

Brief history of Asymmetric Key Cryptography- Overview of Asymmetric Key Cryptography- RSA algorithm- Symmetric and Asymmetric key cryptography together- Digital Signatures-Knapsack Algorithm- Some other algorithms (Elliptic curve Cryptography- ElGamal-problems with the public key exchange).

**UNIT - IV**

Digital Certificates-Private Key Management- The PKIX Model-Public Key Cryptography Standards (PKCS)-XML-PKI and Security- Hash functions- Key Predistribution- Blom's Scheme- Diffie-Hellman Key Predistribution- Kerberos- Diffie-Hellman Key Exchange- The Station-to-station Protocol.

**UNIT - V**

Brief Introductionto TCP/IP- Firewalls- IP Security- Virtual Private Networks (VPN)-Intrusion.

Internet Security Protocols: Basic concepts- Secure Socket Layer (SSL)-Transport Layer Security (TLS)- Secure Hyper Text Transfer Protocol (SHTTP)-Time Stamping Protocol (TSP)- Secure Electronic Transaction (SET)- SSL vs SET- 3-D Secure Protocol- Electronic Money- E-mail Security- Wireless Application Protocol (WAP) Security- Security in GSM- Security in 3G.

**Text Books:**

1. Atul Kahate "Cryptography and Network Security", Tata McGrawHill, 4th Edition, 2008.
2. Charlie Kauffman, Radia Perlman, Mike Spciner, "Network Security", Pearson Education, 2nd Edition, 16 March 2012

**Reference Books:**

1. William Stallings "Cryptography and Network Security", Pearson Education, Fifth Edition.
2. *Douglas Stinson* "Cryptography: Theory and Practice", CRC Press, CRC Press LLC, 3rd Edition, November 1st 2005.
3. Forouzan "Cryptography and Network Security", Tata McGrawHill, 4th Edition, June 3rd 2010.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Describe the concepts of Computer Security and Cryptography and recognize different types of attacks.
2. Demonstrate the Symmetric Key Algorithms and analyze the AES.
3. Apply and understand the concepts of Asymmetric Key Algorithms- Digital Signatures and RSA.
4. Infer and demonstrate Digital Certificates and Public Key Infrastructure.
5. Comprehend security concepts including Network Security, Firewalls and Virtual Private Networks and Internet Security Protocols.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 3 | 2 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | - | - | - | 1 | - | - | - | - | - | - |

| **08PExxx** | **PERVASIVE COMPUTING** | **L** | **T** | **P** |
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**Course Objectives:**

- To familiarize the pervasive computing technologies of past, present and future with examples.
- To impart knowledge on the basic concepts, characteristics and components of device technologies in pervasive computing.
- To introduce the fundamentals of WAP architecture and protocols in pervasive computing.

- To educate the recent trends and latest development of the server side programming technologies.
- To make the student to understand the performance of different data dissemination techniques and algorithms for mobile real-time applications.

**UNIT - I**

Technologies: Past - Present- Future - Pervasive Computing - The pervasive computing market - m-Business - Conclusions and Challenges – Future. Application Examples: Retail - Airline check-in and booking - Sales Force Automation – Healthcare - Tracking – car information systems – Email access via WAP and voice.

**UNIT - II**

Device Technology: Hardware - Human-machine interfaces - Biometrics - Operating Systems - Java for Pervasive devices. Device Connectivity: Protocols - Security - Device Management. Web Application Concepts: History of World Wide Web - World Wide Web Architecture - Protocols - Transcoding - Client Authentication via the Internet.

**UNIT - III**

WAP: Introduction - Components of the WAP architecture - WAP infrastructure - WAP Security Issues - Wireless Markup Language - WAP push - Products - i-mode. Voice Technology: Basics of speech recognition - Voice standards - Speech applications - Speech and pervasive computing - Security.

**UNIT - IV**

Architecture: Server Side Programming in Java: J2EE and overview - Servlets- Enterprise Java Beans Java Server Pages - Extensible Markup Language - Web services - Model-View-Controller Pattern. Pervasive web application architecture: Background- scalability and availability- Development of pervasive computing web applications- Pervasive application architecture.

**UNIT - V**

Example Applications: Introduction- User Interface overview- Architecture- Implementation. Access from PCs: Smart Card-based authentication via the Internet- Ordering goods. Access via WAP: WAP functionality- Implementation. Access via voice: Extending the example application to voice access.

**Text Books:**

1. JochenBurkhardt, Dr. Horst Henn, Stefan Hepper, Klaus Rintdorff, Thomas schaeck “Pervasive Computing Technology and Architecture of Mobile Internet Applications”, Pearson Education sixth Edition (2009).
2. Debashis Saha, “Networking Infrastructure for Pervasive Computing: Enabling Technologies”, Kluwer Academic Publisher, Springer; First edition, (2002).

**Reference Books:**

1. Seng Loke, “Context-Aware Computing Pervasive Systems”, Auerbach Publication, New York, (2007).
2. Uwe Hansmann etl, “Pervasive Computing”, Springer, New York, (2001).
3. Frank Adelstein, Sandeep KS Gupta, Golden Richard, “Fundamentals of Mobile and Pervasive Computing”, McGraw-Hill, (2005).

**Course Outcomes:**

At the end of this course, the students will be able to

1. Summarize the pervasive computing technologies of past, present and future with examples and also develop an attitude to propose solutions with comparisons for problems related to pervasive computing system through investigation.
2. Classify different device technologies of pervasive computing and to demonstrate knowledge about the strengths and limitations of the tools and devices used for development of pervasive computing systems.
3. Illustrate the major system components of WAP architecture and to demonstrate about the standards and basics of voice technologies.
4. Discover the characteristics of pervasive computing applications including server side programming and architectures of the pervasive computing systems.
5. Design application and to develop authentication process for application services including voice access to pervasive computing applications.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | - | - | - | - | - | - | - | 1 |
| **CO2** | 2 | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | - | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | - | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | - | 1 | - | 1 | - | - | - | - | - | - | - |

| **08PExxx** | **ADHOC AND SENSOR NETWORKS** | **L** | **T** | **P** |
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**Course Objectives:**

- To make the students to understands ad-hoc wireless networks and routing protocols.
- To describe the QoS protocols and MAC layer classification
- To explain the concepts of energy management techniques.
- To teach the architecture and issues of wireless sensor networks
- To provide the features of hybrid wireless networks.

**UNIT - I**

Routing: Cellular and Ad hoc wireless networks – Issues of MAC layer and Routing – Proactive, Reactive and Hybrid Routing protocols – Multicast Routing – Tree based and Mesh based protocols – Multicast with Quality of Service Provision.

**UNIT - II**

Quality of Service: Real-time traffic support – Issues and challenges in providing QoS – Classification of QoS Solutions – MAC layer classifications – QoS Aware Routing Protocols – Ticket based and Predictive location based QoS Routing Protocols.

**UNIT - III**

Energy Management: Need for Energy Management – Classification of Energy Management Schemes Battery Management and Transmission Power Management Schemes – Network Layer and Data Link Layer Solutions – System power Management schemes.

**UNIT - IV**

Sensor Networks: Introduction – Sensor Network architecture – Data Dissemination – Data Gathering – MAC Protocols for sensor Networks – Location discovery – Quality of Sensor Networks – Evolving Standards – Other Issues – Recent trends in Infrastructure less Networks.

**UNIT - V**

Hybrid Wireless Networks: Introduction – Next Generation Hybrid Wireless Architectures – Routing in Hybrid Wireless Networks – Pricing in Multi-Hop Wireless Networks – Power Control Schemes in Hybrid Wireless Networks – Load Balancing in Hybrid Wireless Networks.

**Text Books:**

1. C. Siva Ram Murthy and B.S.Manoj, "Ad hoc Wireless Networks – Architectures and Protocols", 1st Edition, Pearson Education, 2006.
2. Feng Zhao and Leonidas Guibas, "Wireless Sensor Networks – An Information Processing Approach", 1st Edition, Morgan Kaufman Publishers, 2004.

**Reference Books:**

1. C.K.Toh, "Adhoc Mobile Wireless Networks: Protocols and Systems", Pearson Education, 2002.
2. Thomas Krag and Sebastin Buettrich, "Wireless Mesh Networking", O'Reilly Publishers, 2007.
3. Carlos De Morais Cordeiro, Dharma Prakash Agarwal, "Adhoc and Sensor Networks: Theory and Applications", World Scientific Publishing Company Private Limited, 2006.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Explain the principles of mobile ad hoc networks (MANETs) and routing protocols.
2. Summarize the QoS protocols and MAC layer classification
3. Analyse and design energy and power management schemes.
4. Describe the architecture and analyze the issues of wireless sensor networks,
5. Discuss the features of hybrid wireless networks.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |

| **08PExxx** | **DIGITAL IMAGE PROCESSING** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce basic concepts like acquiring, storing and processing of images.
- To provide details about image enhancement in spatial and frequency domain.

- To impart knowledge on various techniques of image segmentation.
- To illustrate the concepts of Multi resolution Analysis and image compression.
- To include knowledge on Morphological image processing, image representation scheme and applications of Image Processing.

**UNIT - I**

Fundamentals: Digital Imaging: Introduction – Steps in Image Processing Systems – Image Acquisition – Image Sampling and Quantization – Pixel Relationships – Linear and Nonlinear Operations.

MATLAB: The MATLAB Desktop – Using the MATLAB Editor/Debugger – Getting Help – Saving and Retrieving work Session Data – Digital Image Representation – Image I/O and Display – Classes and Image Types – M-Function Programming.

**UNIT - II**

Image enhancement : Spatial Domain – Gray level Transformations – Histogram Processing – Spatial Filtering – Smoothing and Sharpening. Frequency Domain: Filtering in Frequency Domain – DFT, FFT, DCT – Smoothing and Sharpening filters – Homomorphic Filtering.

**UNIT - III**

Image Segmentation: Detection of Discontinuities – Edge Operators – Edge Linking and Boundary Detection – Thresholding – Region Based Segmentation – Morphological Watersheds – Motion Segmentation.

**UNIT - IV**

Multi Resolution Analysis And Compression: Multi Resolution Analysis: Image Pyramids – Multi resolution expansion – Wavelet Transforms.

Image Compression: Fundamentals – Models – Elements of Information Theory – Error Free Compression – Lossy Compression – Compression Standards.

**UNIT - V**

Morphological Processing And Representation: Morphological Image Processing – Preliminaries – Dilation and Erosion – Opening and Closing – The Hit-or-Miss Transformation.

Representation – Boundary Descriptors – Regional Descriptors – Use of Principal Components for Description – Relational Descriptors – Applications of Image Processing – Image Watermarking – Fingerprint Recognition – Iris Recognition.

**Text Books:**

1. Rafael C.Gonzalez and Richard E.Woods, “Digital Image Processing”, Third Edition, Pearson Education, 2009.
2. Rafael C.Gonzalez, Richard E.Woods and Steven L.Eddins, “Digital Image Processing Using Matlab”, Second Edition, McGraw Hill, 2010.

**Reference Books:**

1. AL. Bovik, “The Essential Guide to Image processing”, Second Edition, Elsevier, 2009.
2. Anil K.Jain, “Fundamentals of Digital Image Processing”, PHI, 2006.
3. Sanjit K. Mitra, & Giovanni L. Sicuranza, “Non Linear Image Processing”, Elsevier, 2007.
4. Maria Petrou, Costas Petrou, “Image Processing: The Fundamentals”, Wiley, Second Edition, 2010.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand fundamentals of digital image processing and capable of using MATLAB tools.
2. Apply image enhancement techniques in spatial and frequency domains.
3. Evaluate algorithms based on image segmentation methods.
4. Analyze basics of multi resolution analysis, image compression and apply both lossy and lossless image compression techniques in image and video based applications.
5. Design image processing techniques for real time applications and understand Morphological image processing, image representation schemes.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | 1 | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | 1 | - | 2 | - | - | - | - | - | - | - |
| **CO3** | 1 | - | 2 | - | 2 | - | - | - | - | - | - | - |
| **CO4** | 2 | - | 1 | - | 2 | - | - | - | - | - | - | - |
| **CO5** | 1 | 1 | 2 | - | 2 | - | - | - | -- | - | - | 1 |

| **08PExxx** | **DIGITAL WATERMARKING AND STEGANOGRAPHY** | **L** | **T** | **P** |
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**Course Objectives:**

- To provide the basic principles and applications of watermarking.
- To represent the various current watermarking techniques.
- To teach the steganography methods associated with secret communication.
- To explain various transform and statistical techniques suitable for steganography.
- To enable he students to understand steganalysis.

**UNIT - I**

Watermarking: Watermarking techniques– History and terminology – Basic Principles – Applications –Requirements of algorithmic design issues: Imperceptibility, Robustness, Security– Evaluation and benchmarking of watermarking system.

**UNIT - II**

Survey of Current Watermarking Techniques: Cryptographic and psycho visual aspects – Choice of a workspace – Formatting the watermark bits – Merging the watermark and the cover – Optimization of the watermark receiver – Extension from still images to video.

**UNIT - III**

Steganography : Principles of Steganography – Frameworks for secret communication – Security of Steganography systems – Information hiding in noisy data – Adaptive versus non-Adaptive Algorithms – Active and Malicious Attackers – Examples of Invisible communications.

**UNIT - IV**

Techniques for Steganography: Stegnographic techniques – Substitution system and bit plane tools – Transform domain techniques – Spread spectrum and information hiding – Statistical Steganography Distortion and cover generation techniques.

**UNIT - V**

Steganalysis : Overview of steganalysis- Statistical Properties of Images - Visual Steganalytic System -IQM-Based Steganalytic System - Learning Strategies - Frequency-Domain Steganalytic System.

**Text Books:**

1. Stefan Katzenbelsser and Fabien A. P. Petitcolas, "Information Hiding Techniques for Steganography and Digital Watermarking", Artech House Publishers, 2004.
2. Frank Y. Shih, "Digital Watermarking and Steganography: fundamentals and techniques", CRC Press, 2007.

**References Books:**

1. Jessica Fridrich, "Steganography in Digital Media: Principles, Algorithms, and Applications", Cambridge University Press, 2010.
2. Abbas Cheddad, Vdm Verlag and Dr. Muller, "Digital Image Steganography: Concepts, Algorithms and Applications", Aktienge sells Chaft & Co. Kg, 2009.
3. Ingemar Cox, Matthew Miller, Jeffrey Bloom, Jessica Fridrich and Ton Kalker, "Digital Watermarking and Steganography", Morgan Kaufmann Publishers, 2007.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand watermarking techniques, analyze the design issues and to evaluate watermarking system.
2. Analyze watermarking techniques used in images and video.
3. Explain principles, information hiding security and attacks of Steganography.
4. Implement Steganography techniques in transform domain and Distortion and cover generation techniques using MATLAB tool.
5. Describe and Develop steganalytic system in discrete and frequency domain.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 1 | 2 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 1 | 1 | 1 | 3 | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 3 | 3 | - | - | - | - | - | - | - | - |

| 08PExxx | DIGITAL SIGNAL PROCESSING | L | T | P |
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**Course Objectives:**

- To introduce the basic components of DSP systems
- To acquire provide knowledge on DFT and its various transformation techniques.
- To explain about the different digital filters (IIR & FIR).
- To impart knowledge on errors associated with digital signal processing.
- To develop the skills required to process speech, music and image.

**UNIT - I**

Basic Elements of Digital Signal Processing Systems - Classification of Signals - The concept of frequency in Continuous time and Discrete time domain - Discrete-time Signals and Systems - Analysis of Discrete Time - Linear Shift-Invariant Systems – Linearity - Causality and Stability criterion. Discrete-time Systems described Difference Equation - Correlation of Discrete - Time Signals.

**UNIT - II**

Introduction to DFT - Properties of DFT - Filtering methods based on DFT - Relation between DTFT and DFT - FFT computations using Decimation in time and Decimation in frequency algorithms - Overlap-add and save methods.

**UNIT - III**

General Consideration - Design of IIR filters - IIR Filter Design by Impulse Invariance & Bilinear Transformation - pre warping - Realization using direct, cascade and parallel forms - Design of Linear Phase FIR Filters - Design of FIR filter using Windows and by Frequency Sampling Method - Frequency Transformation in the Analog Domain and Digital Domain - Realization of FIR filters - Transversal, Linear phase and Polyphase structures.

**UNIT - IV**

Fixed point and floating point number representations - Comparison - Truncation and Rounding errors Quantization noise - derivation for quantization noise power - coefficient quantization error - Product quantization error - Overflow error - Round off noise power - limit cycle oscillations due to product round off and overflow errors - signal scaling.

**UNIT - V**

Multirate Signal Processing - Speech Compression - Adaptive Filter - Musical Sound Processing - Image enhancement - Applications of Multi rate signal Processing

**Text Books:**

1. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing Principles, Algorithms and applications”, Pearson education / Prentice Hall, Fourth edition, 2007.
2. Alan V. Oppenheim, Ronald W. Schafer and Hohn. R.Back, “Discrete Time Signal Processing”, Pearson Education, 2nd edition, 2005.

**Reference Books:**

1. S.Salivahanan, A.Vallavaraj, C.Gnanapriya, “Digital Signal Processing”, TMH/McGraw Hill International, 2007.

2. S.K. Mitra, "Digital Signal Processing, A Computer Based approach", Tata McGraw Hill, 1998.
3. Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2006.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the basic elements of DSP system and to analyze discrete time signals.
2. Apply DFT and FFT in digital signal processing.
3. Design IIR, FIR filters in analog and digital domain.
4. Estimate noise, errors and oscillations in digital signals.
5. Develop applications using MATLAB tool for processing multirate signals speech, sound and image.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 3 | 1 | 2 | - | - | - | - | - | - | - |

| **08PExxx** | **CLOUD COMPUTING** | **L** | **T** | **P** |
|---|---|---|---|---|
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**Course Objectives:**

- To expose the fundamentals of cloud computing and private clouds
- To understand the role of network in cloud computing
- To illustrate the enterprise architecture, VCL cloud architecture, SwinDeW-G Environment and SwinDeW-C architecture.
- To describe cloud services and cloud roles and the applications of cloud computing.
- To provide in-depth knowledge to Google App Engine and Microsoft Azure software vendor specific cloud services.

**UNIT - I**

Introduction - Layers of Cloud Computing - Types - Cloud Computing Versus Cloud services - Cloud Computing Features - Platforms - Challenges - Cloud Computing Security - Model Application Methodology - Cloud-Based High Performance Computing Clusters - Virtual Private Clouds - Data Centers - Applications.

**UNIT - II**

The Role of Networks in Cloud Computing - Cloud Deployment Models and Network - Network Architectures for Clouds - Requirements and Architecture for Hybrid Cloud Networking - Data-Intensive Technologies for Cloud Computing - Characteristics of Data-Intensive Computing Systems Data-Intensive System Architecture - Distributed Agent Based Scheduling Platform Inside Clouds - Basics of Grid and Cloud Computing - Layered Models and Usage patterns in Grid and Cloud.

**UNIT - III**

Enterprise Architecture - Enterprise Knowledge Management - Enterprise Knowledge Architecture -

Enterprise Computing Clouds - Enterprise Knowledge Clouds - Enterprise Knowledge Cloud Technologies - The VCL Cloud Architecture - Integrating High-Performance Computing into the VCL Cloud Architecture - Overview of SwinDeW-G Environment - SwinDeW-C System Architecture - Architecture of SwinDeW-C Peers.

**UNIT - IV**

Cloud Services and Cloud Roles - Infrastructure as a Service - Platform as a Service - Software as a Service - Grids and Clouds - Application Scalability - Automating Scalability - General Cloud Architectures for Scaling - Delivering Scientific Computing services in the Cloud - A Dynamic Collaborative Cloud Services Platform.

**UNIT - V**

Amazon Web Services - Google AppEngine - Microsoft Azure - Scientific Applications - Business and Consumer Applications - Case Study: Cloud as Infrastructure for an Internet Data Center - Cloud Computing for Software Parks - Cloud Computing Supporting SaaS.

**Text Books:**

1. L Borko Furht and Armando J. Escalante, "Handbook of Cloud Computing", Springer, 2010.
2. Dr. Rajkumar Buyya, Dr. Christian Vecchiola and Dr. S Thamarai Selvi, "Mastering Cloud Computing", Tata McGraw Hill, 1st Edition, 2013.

**Reference Books:**

1. Michael Miller, "Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate", Que Publishing, 1st Edition, 2008.
2. D Anthony T Velte, Toby J Velte and Robert Elsenpeter, "Cloud Computing : A Practical Approach", Tata McGraw-Hill, 1st Edition, 2010.
3. John Rittinghouse & James Ransome, "Cloud Computing, Implementation, Management and Strategy", CRC Press, 1st Edition, 2010.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Describe the fundamentals and technologies of cloud computing technologies and cloud services.
2. Discover the Role of Networks in Cloud Computing.
3. Compare and contrast cloud architectures VCL cloud and SwinDew.
4. Analyze cloud services and roles by forming a dynamic collaborative cloud services platform.
5. Understand vendor specific cloud Web services including but not restricted to amazon web services, goggle app engine, Microsoft azure.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 1 | - | - | - | - | - | - | | - | - | 1 |
| **CO2** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 3 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 3 | 1 | - | - | 1 | - | - | - | - | - | - | - |

| 08PExxx | PATTERN CLASSIFICATION | L | T | P |
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**Course Objectives:**

- To introduce the fundamental concepts of pattern recognition systems.
- To provide in-depth understanding of maximum-likelihood, Bayesian parameter estimation methods and hidden Markov model.
- To explain the non-parametric techniques and support vector machine used in machine learning.
- To familiarize clustering, regression algorithms and component analysis used in machine learning.
- To describe the radial basis function neural networks and back-propagation training algorithm used in machine learning with it architectures.

**UNIT - I**

Introduction: Machine perception - pattern recognition systems - design cycle - learning and adaptation - Bayesian decision theory: Continuous features – minimum-error-rate classification - classifiers, discriminant functions, and decision surfaces - normal density - discrete features - Bayesian belief networks.

**UNIT - II**

Maximum-Likelihood and Bayesian Parameter Estimation: Introduction – Maximum-likelihood estimation - Component analysis and discriminants: Principal component analysis - fisher linear discriminant - multiple discriminant analysis – Expectation-maximization algorithm - Hidden Markov models: Evaluation - decoding - learning

**UNIT - III**

Non-parametric Techniques:Introduction - Probabilistic neural networks –k-nearest neighbor rule - Metrics andNearest-Neighbor Classification - Linear discriminant functions: Linear discriminant functions and decision surfaces - Support vector machines: Training

**UNIT - IV**

Non-metric Methods and Unsupervised Learning: Introduction- Decision trees - Classification and regression trees - Unsupervised learning and Clustering: K-means clustering - fuzzy k-means clustering - Component analysis: Principal component analysis - nonlinear component analysis - independent component analysis.

**UNIT - V**

Multilayer Neural Networks :Introduction – Feed-forward Operation and Classification - perceptron training algorithm – Back-propagation training algorithm and error surfaces - Radial basis function neural network training algorithm.

**Text Books:**

1. R. O. Duda, E. Hart, and D.G. Stork, “Pattern classification”, John Wiley & Sons, Singapore, second edition, 2003.
2. Chen C H, “Handbook of pattern recognition and computer vision”, World Scientific Co, Pvt. Ltd., 4th edition 2010

**References Books:**

1. S. Haykin, “Neural networks: A comprehensive foundation” , Pearson education, Singapore, second edition 2001.
2. V. Vapnik, “Statistical learning theory”, John Wiley & Sons, New York, 1998.

3. J.C. Burges Christopher, "A tutorial on support vector machines for pattern recognition", Data mining and knowledge discovery, pp. 121-167, 1998.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the basic concepts of pattern recognition systems.
2. Apply maximum-likelihood, Bayesian parameter estimation methods and hidden Markov model for solving a problem.
3. Build the probabilistic neural networks and support vector machine models for solving real word classification problems.
4. Implement principal component analysis and linear discriminant analysis for reducing the dimension of feature vectors.
5. Build classification architectures including radial basis function neural network and back-propagation training algorithm for solving real-world classification problems.

| Mapping of Course Outcomes with Program Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - |
| **CO4** | 2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - |
| **CO5** | 2 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - |

| **08PExxx** | **ARTIFICIAL INTELLIGENCE AND FUZZY SYSTEMS** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the basics of artificial intelligence (AI) and intelligent agents (IA).
- To explain different searching methods used for solving well defined problems.
- To familiarize knowledge representation and reasoning using propositional and predicate logic.
- To understand the methods of representing uncertainty in knowledge using probabilistic reasoning.
- To impart knowledge on agent communication and fuzzy logic based systems.

**UNIT - I**

Introduction: What Is AI - Intelligent Agents: Agents and Environments. Good Behavior: The Concept of Rationality - The Nature of Environments - The Structure of Agents.

**UNIT - II**

Solving Problems by Searching**:** Problem solving agents - Well defined Problems and Solutions - Formulating Problems. Uniformed Search Strategies: BFS – DFS- Depth Limited Search - Iterative Deepening - Bidirectional Search - Informed Search Methods: Hill climbing search - A* search - Constraint Satisfaction Problems- Adversarial Search: Games - Optimal Decisions in Games - The Minimax Algorithm - Optimal Decisions in Multiplayer Games - Alpha -Beta Pruning - Imperfect Real-Time Decisions - Evaluation Functions - Cutting off Search.

**UNIT - III**

Knowledge and Reasoning: Logical Agents: Knowledge Based Agents, Logic - Propositional Logic – Semantics – Inference – Equivalence - Validity and Satisfiability- Reasoning Patterns in Propositional Logic – Resolution - First Order Logic: Syntax and Semantics - Symbols and Interpretations – Terms - Atomic Sentences – Quantifiers - Inference in First Order Logic: Unification – Resolution - Uncertainty: Acting Under Uncertainty - Handling Uncertain Knowledge - Basic Probability Notations – Propositions - Atomic Events - Prior and Conditional Probability - Baye's Rule and its use.

**UNIT - IV**

Probabilistic Reasoning: Representing knowledge in uncertain domain - semantics of Bayesian networks - Making simple decisions: Decision networks - Representing a Decision problem with a Decision Network - evaluating Decision Networks - Planning: The planning problem - Planning with State Space Search - Forward State Space Search - Backward State Space Search - Heuristics for State Space Search, Partial Order Planning. Knowledge in Learning: A Logical Formulation of Learning - Knowledge in Learning, Learning from Examples, Discovery as Learning - Learning by Analogy - Explanation Based Learning.

**UNIT - V**

Communication: Communication as Action - Fundamentals of Language - The Component Steps of Communication - Formal Grammar - Syntactic Analysis - Semantic Interpretation - Fuzzy Logic systems: Introduction - Crisp Sets - Fuzzy Sets - Fuzzy Terminology - Logic Control - Fuzzy Inference Processing - Fuzzy Hedges - α Cut Threshold - Neuro Fuzzy Systems.

**Text Books:**

1. Stewart Russel and Peter Norvig. "Artificial Intelligence - A Modern Approach", Prentice Hall International, 1995.
2. Elain Rich and Kevin Knight, "Artificial Intelligence", Tata McGraw Hill, Second Edition, 1993.

**Reference Books:**

1. Nils J.Nilsson, "Artificial Intelligence - A New Synthesis ", Harcourt Asia PTE Ltd, Morgan Kaufmann, 1988.
2. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
3. Patrick Henry Winston, "Artificial Intelligence", Addison Wesley, Third Edition, 2000.
4. M. Tim Jones, "Artificial Intelligence: A Systems Approach", Computer Science, Jones and Bartlett Publishers, First Edition, 2008.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the fundamental concepts of artificial intelligence (AI) and the structure of an intelligent system (IA).
2. Solve well defined problems using searching algorithms including depth first search, hill climbing, A* and minimax.
3. Develop the skills for knowledge representation and reasoning using propositional and predicate logic.

4. Demonstrate the methods of representing uncertainty in knowledge using Bayesian and decision networks.
5. Design a component for communicating agent and fuzzy logic based artificial intelligence system.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - |
| **COl** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 1 | 2 | 3 | 2 | - | - | - | - | - | 2 | - | - |

| **08PExxx** | **DATA MINING** | **L** | **T** | **P** |
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**Course Objectives:**

- To enable the student to understand the data warehousing component and Multidimensional data model.
- To explain the concepts of Data warehousing Architecture and Implementation
- To describe the methodologies used for data preprocessing
- To teach various techniques used in classification and clustering.
- To expose the concepts of advanced data mining.

**UNIT - I**

Evolution of Decision Support Systems - Data warehousing Components – Building a Data warehouse - Data Warehouse and DBMS - Data marts – Metadata - Multidimensional data model - OLAP Vs OLTP - OLAP operations - Data cubes - Schemas for Multidimensional Database: Stars, Snowflakes and Fact constellations.

**UNIT - II**

Types of OLAP servers- 3 – Tier data warehouse architecture - distributed and virtual data warehouses - Data warehouse implementation - tuning and testing of data warehouse - Data Staging (ETL) Design and Development - data warehouse visualization - Data Warehouse Deployment – Maintenance – Growth - Business Intelligence Overview - Data Warehousing and Business Intelligence Trends - Business Applications - tools- SAS.

**UNIT - III**

Data mining - KDD versus data mining - Stages of the Data Mining Process - task primitives -Data Mining Techniques - Data mining knowledge representation – Data mining query languages - Integration of a Data Mining System with a Data Warehouse – Issues-Data preprocessing – Data cleaning - Data transformation - Feature selection - Dimensionality reduction - Discretization and generating concept hierarchies - Mining frequent patterns – association - correlation.

**UNIT - IV**

Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Lazy Learners – Other Classification Methods – Clustering techniques – Partitioning methods - k-means- Hierarchical Methods – distance based agglomerative and divisible clustering - Density-Based Methods – expectation maximization - Grid Based Methods – Model-Based Clustering Methods – Constraint – Based Cluster Analysis – Outlier Analysis.

**UNIT - V**

Statistics and Data Analysis – EDA – Small and Big Data – Logistic Regression Model - Ordinary Regression Model - Mining complex data objects – Spatial databases – Temporal databases – Multimedia databases – Time series and sequence data – Text mining – Web mining – Applications in Data mining.

**Text Books:**

1. Jiawei Han and Micheline Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann Publishers, third edition, 2011.
2. Alex Berson and Stephen J. Smith, "Data Warehousing, Data Mining & OLAP", Tata McGraw Hill Edition, Tenth Reprint, 2007.

**References Books:**

1. G. K. Gupta, "Introduction to Data Min Data Mining with Case Studies", Prentice Hall of India, Easter Economy Edition, 2006.
2. Ian.H.Witten, Eibe Frank and Mark.A.Hall, "Data Mining: Practical Machine Learning Tools and Techniques", Third edition, (Then Morgan Kufmann series in Data Management systems), 2011.
3. Bruce Ratner, "Statistical and Machine learning –Learning Data Mining, techniques for better Predictive Modeling and Analysis to Big Data", CRC Press, Second Edition, 2011.
4. Mehmed kantardzic, "Data mining concepts, models, methods, and algorithms", Wiley-Interscience, IEEE Press, 2nd Edition, 2003.
5. Ian Witten, Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Morgan Kaufmann, third edition, 2011.
6. George M Marakas, "Modern Data Warehousing, Mining and Visualization", Prentice Hall, Second Edition, 2003.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the functionality of the various data mining and data warehousing component.
2. Develop the Data warehousing Architecture and Implement.
3. Classify the methodologies used for analysis of data
4. Compare various techniques which enhance the data modeling.
5. Analyze developing areas such as web mining, text mining and ethical aspects of data mining

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | 2 | - | - | - | - | - | - | - |
| **CO2** | 2 | - | 1 | 1 | 1 | - | - | - | - | - | - | - |
| **COl** | 1 | - | 2 | 1 | 2 | - | - | - | - | - | - | - |
| **CO4** | 1 | - | - | 2 | 2 | - | - | - | - | - | - | - |
| **CO5** | 1 | - | - | - | 2 | - | - | - | - | - | - | 1 |

| **08PExxx** | **UNIX PROGRAMMING** | **L** | **T** | **P** |
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**Course Objectives:**

- To familiarize the Unix Architecture and basic Unix commands.
- To disseminate the knowledge about Unix file system, VI editor, text processing and backup utilities commands
- To impart shell scripts programming skills.
- To make the students to write shell scripts using pipes, Tee commands and quotes.
- To develop the skills required to write program for maintaining files, directories, library function and errors.

**UNIT - I**

Introduction to Unix: Architecture of Unix - Features of Unix - Unix Commands: path, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

**UNIT - II**

Unix Utilities: Introduction to unix file system – vi editor – file handling utilities – security by file permissions – process utilities – disk utilities – networking commands: unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin – Text processing utilities and backup utilities commands: tail, head , sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio.

**UNIT - III**

Bourne shell : shell – shell responsibilities – pipes and input Redirection – output redirection – documents – shell programming language – shell meta characters – shell variables – shell commands the environment – control structures – shell script examples.

**UNIT - IV**

Unix Session – Standard Streams – Redirection – Pipes – Tee Command – Command Execution – Command Line Editing – Quotes – Command Substitution – Job Control – Aliases – Variables – Predefined Variables – Options.

**UNIT - V**

Unix Internals: Unix file structure – directories – files and devices – system calls – library functions –

low level file access – usage of open, create, read, write, close, lseek, stat, fstat, ioctl, umask, dup and dup2, the standard I/O ( fopen, fclose, fflush, fseek, fgetc, getc, getchar, fputc, putc, putchar, fgets, gets ), formatted I/O – stream errors – streams and file descriptors – file and directory maintenance (chmod, chown, unlink, link, symlink, mkdir, rmdir, chdir, getcwd) – Directory handling system calls (opendir, readdir, closedir, rewinddir, seekdir, telldir).

**Text Books:**

1. Eric S. Raymond "The Art of Unix Programming" Pearson Education, 2004
2. Sumitabha Das, "UNIX Concepts and Applications", Fourth Edition, Tata McGraw Hill, 2006.

**Reference Books:**

1. B. Goodheart, J. Cox, "The Magic Garden Explained", Prentice Hall of India, 1986.
2. S. J. Leffler, M. K. Mckusick, M. J. .Karels andJ. S. Quarterman., "The Design and Implementation of the 4.3 BSD Unix Operating System", Addison Wesley, 1998.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire knowledge about UNIX commands.
2. Build the UNIX program using Unix Utilities and file systems.
3. Implement the UNIX program using shell scripts.
4. Construct the shell program using UNIX session, pipes, tee commands, quotes and option.
5. Build the UNIX file structure using system calls, library function and error function.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | - | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | - | - | 1 | - | - | - | - | - | - | - | - | - |
| **COl** | 2 | 1 | 2 | - | - | - | - | - | - | - | - | - |
| **CO4** | 1 | - | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO5** | 2 | 1 | 3 | 1 | 2 | - | - | - | - | - | - | - |

| **08PExxx** | **NATURAL LANGUAGE PROCESSING** | **L** | **T** | **P** |
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**Course Objectives:**

- To familiarize the students with the basic concepts involved in Natural Language Processing.
- To impart knowledge on Speech Recognition, and Hidden Markov model.
- To educate about part-of-speech tagging and parsing with context free grammars.
- To inculcate knowledge on feature structures and predicate calculus.
- To enable the student to learn semantic analysis and language generation.

**UNIT - I**

Natural Languages – Language and grammar – Understanding Indian Languages – NLP applications Information Retrieval –Introduction to language modelling – Various grammar based Language Models – Statistical language model – Regular expressions – Finite state Automata – Morphology and finite state transducers.

**UNIT - II**

N-gram models of syntax – Counting words – Unsmoothed N-grams – Smoothing – Back off – Deleted Interpolation – Entropy – Speech Recognition – Speech Recognition architecture – Hidden Markov models – Prosody and Intonation.

**UNIT - III**

Word classes and Part-of-Speech Tagging – Tagsets – Transformation based tagging – Context free rules and trees – The noun phrase – Co-ordination – Verb phrase – Finite state and context free grammars – Parsing with context free grammars – Top down parsing – Bottom up parsing – Problems with top and Bottom up parsing – The Earley algorithm.

**UNIT - IV**

Feature structures – Implementing unification – Unification constraints – Probabilistic context free grammars – Problems – Lexicalized context free grammars – Dependency grammars – Human parsing – Representing meaning – First order predicate calculus.

**UNIT - V**

Semantic analysis – Attachments – Idioms – Compositionality – Robust semantic analysis – Lexical semantics – Introduction to Language Generation – An Architecture for generation – Different methods of Machine Translation.

**Text Books:**

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Pearson Education, Eighth Edition, 2012.
2. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

**Reference Books:**

1. Miechael W. Berry, "Survey of Text Mining: Clustering, Classification and Retrieval Systems", Springer Verlilag, 2003.
2. James Allen, Bejamin/cummings, "Natural Language Understanding", 2nd edition, 1995.
3. C. Manning and H.Schutze, "Foundation of Stastical Natural Language Processing, MIT Press. Cambridge, MA: May 2000.
4. Bharati A., Chaitanya V and Sangal R, "Natural Language processing: A Paninian Perspective", Prentice Hall of India, 1993.
5. Nitin Indurkhya and Fred J. Damerau, "Handbook of Natural Language Processing", 2nd edition, Chapman & Hall/Crc: Machine Learning & Pattern Recognition, CRC press, Feb 2010.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Summarize the basic concepts involved in Natural Language Processing.
2. Analyze the techniques involved in speech recognition.
3. Construct part-of-speech tagging and parsing with context free grammars.
4. Elaborate about feature structures and predicate calculus.
5. Examine the perception related to semantic analysis and language generation.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
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| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 1 | 1 | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 1 | - | 1 | - | - | - | - | - | - | - |
| **COl** | 2 | 1 | 2 | 2 | 1 | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO5** | 1 | 2 | 1 | - | 1 | - | - | - | - | - | - | - |

# PE-LAB - PROFESSIONAL ELECTIVE LABS

| 08PExxx | JAVA AND WEB DESIGN LAB | L | T | P |
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**Course Objectives:**

- To prepare the students to write JAVA programs for implementing OOPS concepts.
- To impart programming skills for creating HTML WebPages using java script, ASP.

**LIST OF EXERCISES**

1. Write a java program to implement a concept of inheritance.
2. Write a java program to draw a house for implementing a applet concept.
3. Write a Java program for implementing a multithreading concept.
4. Write a code to generate a Exception handling
5. Implementing a java concept in polymorphism to construct a employee details.
6. Write a java program to implement linked list concept
7. A Java program for implementing overloading.
8. Implement a java program to build a constructor.
9. To create a simple HTML page using different tags.
10. To create a webpage for the use of predefined functions.
11. To demonstrate exception handling in JavaScript.
12. To display an E-calendar using JavaScript.
13. To design a webpage to validate registration form.
14. To develop a webpage for cookies using ASP.
15. To create a simple servlet program to display the date.
16. To create a CD catalog using XML.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Develop the programs in JAVA programming Language.
2. Construct the WebPages, Serve let programs using java script, ASP and XML.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 1 | 1 | 2 | 2 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| 08PExxx | PERL PROGRAMMING LAB | L | T | P |
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**Course Objectives :**

- To provide hands-on experience for creating effective reusable Perl script that could be run of Unix, Linux and Windows OS.
- To train the students to develop perl programs for GUI development.

**LIST OF EXERCISES**

1. Perl program to display the text "hello world".
2. Addition of two numbers with and without using Command line arguments.
3. Perl program to check a number for prime or not.
4. Perl program to check a number for Armstrong or not.
5. To find average of numbers using Function. (call by value and return argument).
6. Recursive function to find factorial of a number.
7. Perl program for Copying content of one file to another.
8. Adding and Removing Elements in an Array.
9. Perl script to send a plain message and attachment.
10. Perl code to implement a simple client-server program using Perl socket
11. Passing Radio Button Data to CGI program.
12. Perl program to accept UNIX command from a HTML form and display the output of the command execute.
13. Perl program to accept the user name and display a greeting message randomly chosen from a list of 4 greeting messages.
14. Write a Perl program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings.
15. Write a Perl program to display a digital clock which displays the current time of the server.
16. Write a Perl program to insert name and age information entered by the user into a table created using MySQL and to display the current contents of this table.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Apply Perl programming constructs for implementing simple programming tasks.
2. Develop Perl script for real world applications including sending message, accepting UNIX command, displaying digital clock and to use tables.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 3 | 1 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| 08PExxx | VISUAL PROGRAMMING LAB | L | T | P |
|---|---|---|---|---|
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**Course Objectives:**

- To impart programming skills for developing simple VB applications using VB controls.
- To train the students to develop programs for handling files and data bases.

**LIST OF EXERCISES**

1. Calculation of simple interest and compound interest
2. Checking character case
3. Checking Vowels
4. Case Conversion
5. String Operations
6. Arithmetic Operations using Menus
7. Working with Controls (options Button, Scroll Bar and list Box )
8. Text Editor Creation
9. Scientific Calculator
10. Freehand Drawing
11. Calendar Application
12. Quiz Creation
13. File and Folder Control
14. Database Access using Data Control
15. Chat Application using Win sock Control
16. Database Creation using ADO.NET
17. Database Updation using ADO.NET
18. Table View using Data grid
19. Database Creation using Data grid

**Course Outcomes:**

At the end of this course, the students will be able to

1. Design GUI using VB.NET Controls for processing numbers, characters and strings.
2. Develop VB applications for file handing and database with the use of ADO.NET and Data grid.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 2 | 1 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| 08PExxx | MOBILE APP DEVELOPMENT LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**Course Objectives:**

- To develop the skills required to explore the components of Android Studio IDE.
- To prepare the students to create basic and advanced android applications.

**LIST OF EXERCISES**

1. Study of Android Studio IDE.
2. Displaying "Hello World".
3. Designing UI based on Layouts.
4. Navigation in Android.
5. Factorial Calculation App.
6. Simple Calculator App.
7. Making phone call using App.
8. Storing and retrieving data from local storage.
9. Video player App.
10. Creating a Web View App.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Interpret the components and features available in Android Studio IDE.
2. Develop basic and advanced android applications.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 1 | 3 | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 3 | 2 | - | - | - | - | 1 | - | - | 2 |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| 08PExxx | SOFTWARE TESTING LAB | L | T | P |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**Course Objectives:**

- To provide the students with simple experiments to understand the basic aspects about the behavior of the testing techniques to detect the errors in the software.
- To understand standard principles to check the occurrence of defects and its removal.

**LIST OF EXERCISES**

1. Write a C program for matrix multiplication to understand the causes of failures
2. Write a C program for Binary Search - Path Testing

3. Write a C program to derive test cases based on boundary value analysis
4. Write a C program for cause effect graph to check whether defect is found in the program
5. Write a C program to perform data flow testing for the given code and find out all d-use pairs
6. Write a C program to demonstrate the working of the looping constructs:
7. Write and test a program to count number of check boxes on the page checked and unchecked count using selenium tool.
8. Write and test a program to provide total number of objects present available on the page using selenium tool.
9. Write and test a program to login a specific web page using selenium tool.
10. Write and test a program to select the number of students who have scored more than 60 in any one subject ( or all subjects ).
11. Write a Java script to develop a web page which calculates the GCD of 2 numbers using Selenium server.
12. Write and test a program to update 10 student records into table into Excel file using selenium tool.

**Course Outcomes :**

At the end of this course, the students will be able to

1. Investigate the Reasons for Bugs and Analyze the principles in Software Testing.
2. Implement various Test Processes for Quality Improvement.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | - | 1 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08PExxx** | **DISTRIBUTED SYSTEMS LAB** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**Course Objectives:**

- To create the remote method invocation and objects
- To build the idea of peer to peer services and file system
- To demonstrate the components and support required for distributed system

**LIST OF EXERCISES**

1. Calculating average marks of five students
2. Displaying Prime Number Series for the Given Number
3. Displaying Days of the Week of a Given Input
4. Finding top three marks in a class.
5. Factorial of a given number
6. Fibonacci Series for the Given Number

7. Evaluation of Cosine, Sine and Exponential Series
8. Quadratic Equation Evaluation in Java RMI
9. Simple Arithmetic operations in Java RMI
10. Implementation of CORBA file.
11. Creation of student mark file.
12. Manipulation of Various String Operations
13. Implementation of friend functions.
14. Implementation of Exception handling.
15. Implementation of multithreading concept.
16. Implementation of inheritance concepts.
17. Create a menu based application.
18. Create a package for bank details.

**Course Outcomes:**

At the end of this course, the students will be able to:

1. Acquire the knowledge on foundations of distributed System
2. Predict the remote method invocation and objects in the distributed system.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | 3 | 3 | 3 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| **CO2** | 3 | 3 | 3 | 3 | 1 | - | 2 | - | - | 1 | 1 | 1 |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08PExxx** | **DATA MINING LAB** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**Course Objectives:**

- To provide hands-on experience for implementation of data mining tasks, performance evaluation of supervised and unsupervised algorithms of data mining with the tools and techniques used for Knowledge Discovery in Data warehouses using WEKA.
- To train the concepts of web mining and text mining concepts using WEKA.

**LIST OF EXERCISES**

1. Introduction to WEKA
2. Introduction to attributes in WEKA
3. Preprocessing a Student dataset
4. Preprocessing a Labour dataset
5. Training a classification algorithm
6. Testing the training set
7. Cross validation
8. Association rule process on contactlenses dataset using apriori algorithm
9. Association rule process on test dataset using apriori algorithm

10. Classification process using j48 algorithm
11. Classification using ID3 algorithm
12. Classification via Naïve Bayes
13. Clustering process on Iris dataset using simple k-means
14. Clustering process on Student dataset using simple k-means

**Course Outcomes:**

At the end of this course, the students will be able to

1. Design and Demonstrate performance evaluation of supervised and unsupervised algorithms of data mining with the tools and techniques used for Knowledge Discovery in Data warehouses using WEKA.
2. Experiment the concepts of web mining and text mining concepts using WEKA.
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 3 | 3 | 3 | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08PExxx** | **UNIX PROGRAMMING LAB** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 0 | 0 | 3 |

**Course Objectives:**

- To train simple scripts with basic commands
- To prepare the students to write program for string handling and file handling

**LIST OF EXERCISES**

1. Introduction to UNIX and programming commands
2. Finding leap year
3. Fibonacci series
4. List the files and directories accessed in the last 10 days
5. Palindrome checking
6. File operation
7. Unix utilities
8. Find the number of characters, words and lines for a given file without using wc command
9. Calculate ${}^{n}c_{r}$ value using recursion
10. Sorting of ‘n’ numbers / alphabets using awk
11. Check disk space and send an email alert
12. Pattern match in a file
13. Drawing a special pattern
14. Encrypt a file/directory
15. Checking server utilization
16. Implement copy, move and merge commands
17. Convert starting lowercase letter of each word into uppercase in a file

18. Display the directories in a given directory
19. List the files with size 200 bytes and remove files with 0 bytes
20. Report file type, number of links, time of last access and rwx permissions for each file

**Course Outcomes :**

At the end of this course, the students will be able to

1. Develop simple scripts with basic commands
2. Implement the program for file operations, networking and drawing patterns
3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Program Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | 1 | 2 | 1 | 1 | - | - | - | - | - | - | - |
| **CO2** | 3 | - | 3 | - | 2 | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

| **08PExxx** | **NATURAL LANGUAGE PROCESSING LAB** | **L** | **T** | **P** |
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**Course Objectives:**

- To familiarize fundamental concepts in the area of natural language processing and finite state automata.
- To implement parsing techniques and to inculcate the skills on language modeling.

**LIST OF EXERCISES**

1. Write a program to construct FSA for the given word or statement.
2. Write a program to convert into a Regular Expression for the any given word.
3. Write a program to parse a sentence or any string into distinct words.
4. Write a program to count the number of given words using N-gram in a sentence.
5. Write a program to get the number of occurrences of each word in a String.
6. Write a program to implement morphological operations.
7. Write a program to implement finite state transducers.
8. Write a program to perform Simple Expression Evaluator.
9. Write a program to implement Syntactic Level Analysis.
10. Write a program to implement Semantic Analysis.
11. Write a program to implement top down parsing with Context Free Grammar.
12. Write a program to implement bottom up parsing with Context Free Grammar.
13. Write a program to implement Earley algorithm.
14. Write a program to implement Lexical semantics.

**Course Outcome:**

After successful completion of this course, student will be able to

1. Understand approaches to syntax and semantics in NLP and Finite state automata.
2. Apply parsing techniques using context free grammar.

3. Demonstrate an ability to listen and answer the viva questions related to programming skills needed for solving real-world problems in Computer Science and Engineering.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| CO1 | 3 | 3 | 2 | 1 | - | - | - | - | - | - | - | - |
| CO2 | 3 | 3 | 2 | - | 1 | - | - | - | - | - | - | - |
| CO3 | 2 | 2 | - | - | - | - | - | - | - | 2 | - | 2 |

# OPEN ELECTIVES

| 08OExxx | ENTERPRISE RESOURCE PLANNING | L | T | P |
|---|---|---|---|---|
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**Course Objectives:**

- To introduce the basic concepts of ERP and to impart knowledge about data mining and warehousing.
- To understand the key implementation issues of ERP.
- To explain the concepts on the business UNIT – s of ER.
- To expose knowledge of some popular products in the area of ERP.
- To familiarize the current and future trends in ERP.

**UNIT - I**

ERP: Enterprise – An Overview – Basic ERP Concepts – Risks of ERP - Benefits of ERP - ERP and Related Technologies – Business Intelligence(BI) - Business Process Reengineering (BPR) - Data Warehousing - Data Mining – OLAP – SCM.

**UNIT - II**

Implementation Challenges – Implementation Strategies - ERP Implementation Lifecycle - Implementation Methodologies - Vendors and Consultants - Contracts with Vendors - Consultants and Employees - Project Management and Monitoring – Post Implementation Activities.

**UNIT - III**

Business UNIT - s of an ERP Package - Finance, Manufacturing - Human Resources - Plant Maintenance - Materials Management - Quality Management – Marketing - Sales and Distribution.

**UNIT - IV**

ERP Market Place and Market Place Dynamics - SAP AG – PeopleSoft - JD Edwards – Oracle Corporation – QAD Inc – QAD Analytics - QAD Open Technology – SSA Global – Lawson Software - Epicor – Intuitive – ERP UNIT - s.

**UNIT - V**

Turbo Charge the ERP System – Limitations of ERP Systems – Enterprise Application Integration (EAI) - ERP and E-Business – ERP, Internet and WWW – ERP and Total Quality Management - Future Directions and Trends in ERP.

**Text Books:**

1. Alexis Leon, “ERP Demystified”, Tata McGraw Hill, New Delhi, 2008.
2. Mary Sumner, “Enterprise Resource Planning”, Pearson Education, 2007.

**Reference Books:**

1. Joseph A Brady, Ellen F Monk, Bret Wagner, “Concepts in Enterprise Resource Planning”, Thompson Course Technology, USA, 2012.
2. Vinod Kumar Garg and Venkitakrishnan N K, “Enterprise Resource Planning – Concepts and Practice”, PHI, New Delhi, 2003.
3. K.Ganesh, Sanjay Mohapatra, S.P.Anbuudayasankar, P.Sivakumar, “Enterprise Resource Planning: Fundamentals of Design and Implementation”, Springer, 2014.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the risk associated with business process and data mining.
2. Analyze the methodologies associated with project management and monitoring.
3. Design and develop ERP implementation cycle.
4. Identify the core and extended UNIT - s of ERP.
5. Differentiate the different applications of ERP.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | - | 1 | 1 | - | - | - | - | - | - | - | 2 |
| **CO4** | 1 | - | - | - | 2 | - | - | - | - | - | - | - |
| **CO5** | 1 | - | - | - | - | - | - | - | - | - | - | - |

| **08OExxx** | **E- COMMERCE** | **L** | **T** | **P** |
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**Course Objectives:**

- To teach the components and applications of e-commerce infrastructure
- To impart knowledge on e-commerce and web
- To provide an understanding of the design and types of Electronic Payment Systems and EDI
- To explain the concepts of Internal Information Systems, Digital Library and Digital Documents
- To educate the students on On-Demand Education and Software Agents

**UNIT - I**

E-Commerce Infrastructure: E-Commerce framework – Media Convergence – Anatomy of E-Commerce Applications – Consumer and Organization Applications – Market forces influencing the I-way – Components of the I-way – Network Access Equipment – Distribution Networks – Issues – Internet Terminology – NSFNET – Research and Education network – Internet Governance.

**UNIT - II**

E-Commerce and Web: Architecture frame work for E- Commerce – WWW as the architecture – Hypertext publishing – Technology and Security on Web – Consumer Oriented Applications – Mercantile Process Model – Mercantile Models from the perspective of Consumer and merchants.

**UNIT - III**

Electronic Payment Systems and EDI: Types of Electronic payment systems – Digital token based system – Smart cards – Credit card based system – Risk factors – Designing Electronic payment systems. EDI – EDI Applications in business – Legal, Security and Privacy issues – Standardization in EDI – EDI software implementation - EDI envelope – VANs – Internet based EDI.

**UNIT - IV**

Inter organizational E-Commerce and Marketing: Internal Information Systems - Macro forces and Internal Commerce – Work-flow automation – Customization – SCM – Corporate Digital Library: Dimensions, Making a business case, Types of Digital Documents – Advertising on Internet – Charting the online marketing process – Market Research

**UNIT - V**

On-Demand Education and Software Agents: Computer based Education and Training – Technological Components – Digital Copyrights and E-Commerce – History of software agents – Characteristics and Properties of Agents – Technology behind the Agents – Telescript Agent Language – Safe-Tcl – Software Agents in action –SGML.

**Text Book:**

1. Kenneth C. Laudon, "E - Commerce : Business, Technology", Society, 10th Edition, 2016.

**Reference Books:**

1. Ravi Kalakota, Andrew B. Whinston, "Frontiers of Electronic Commerce", Paperback – Addison-Wesley Publishing Company, 1999.
2. Dave Chaffey, "E - Business and E - Commerce Management: Strategy, Implementation and Practice", 2013.
3. Tharam Dillon , Elizabeth Chang, "E-Commerce: Fundamentals and Applications ", Wiley publication 2007.
4. David Whiteley, "E - Commerce: Strategy, Technologies and Applications", Tata Mc Hill 2001.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Summarize the features and components of e-commerce framework and applications.
2. Explain the relationship between E-Commerce and web.
3. Design Electronic Payment Systems and implement EDI software taking into account risks, legal, security, privacy issues.
4. Describe the features of Internal Information Systems, Digital Library and Digital Documents.
5. Explain the characteristics, properties, technology and language of software agents.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | - | - | - | - | 1 | 1 | - | - | - | - | - | - |
| **CO3** | 2 | - | 2 | - | - | - | - | 2 | 1 | - | - | - |
| **CO4** | - | - | - | - | - | 1 | - | - | - | - | - | - |
| **CO5** | - | - | - | - | 2 | - | - | - | - | -- | - | - |

| **08OExxx** | **BIO INFORMATICS** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the basic concepts of BIO informatics technologies.
- To impact knowledge about Data warehousing Architecture, DNA of data analysis and Neural Network Architecture.
- To Provide basic Knowledge of Hidden Markov Model, Bayesian networks and Boolean networks.
- To familiarize the basic Properties and Concepts of Pattern Matching and Visualization.
- To explain about Micro array analysis, Cluster analysis and Bench mark.

**UNIT - I**

Introduction: Need for Bioinformatics technologies –Overview of Bioinformatics technologies Structural bioinformatics –Data format and processing–Secondary resources and applications –Role of Structural bioinformatics -Biological Data Integration System.

**UNIT - II**

Data warehousing and data mining in bioinformatics: Bioinformatics data –Data warehousing architecture –data quality –Biomedical data analysis – DNA data analysis –Protein data analysis – Machine learning –Neural network architecture and applications in bioinformatics.

**UNIT - III**

Modeling for bioinformatics: Hidden markov modeling for biological data analysis –Sequence identification –Sequence classification–multiple alignment generation –Comparative modeling – Protein modeling – genomic modeling –Probabilistic modeling –Bayesian networks –Boolean networks-Molecular modeling –Computer programs for molecular modeling.

**UNIT - IV**

Pattern matching and visualization: Gene regulation –motif recognition –motif detection –strategies for motif etection –Visualization –Fractal analysis –DNA walk models–one dimension –two dimension –higher dimension –Game representation of Biological sequences –DNA, Protein, Amino acid sequences.

**UNIT - V**

Microarray analysis: Microarray technology for genome expression study –image analysis for data extraction –preprocessing –segmentation –gridding –spot extraction –normalization, filtering –cluster analysis –gene network analysis –Compared Evaluation of Scientific Data Management Systems – Cost Matrix –Evaluation model -Benchmark –Tradeoffs.

**Text Books:**

1. Yi-Ping Phoebe Chen (Ed),"BioInformatics Technologies", First Indian Reprint, Springer Verlag, 2007.
2. Arthur M.Lesk, "Introduction to bioinformatics", First Edition, Oxford University Press,2002.

**Reference Books:**

1. Bryan Bergeron, "Bio Informatics Computing", Second Edition, Pearson Education, 2003.
2. Arthur M Lesk, "Introduction to Bioinformatics", Second Edition, Oxford University Press, 2005.
3. Dan E.Krane, Michael L.Raymer, "Fundamental Concepts of Bioinformatics", First Edition, 2002.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire the basic concepts in BIO informatics technologies.
2. Understand the concepts of Data warehousing Architecture, DNA data analysis and Neural Network Architecture.
3. Analyze Hidden Markov Model, Bayesian networks and Boolean networks
4. Implement Gene regulation, fractal analysis using Pattern Matching.
5. Understand the Concept of micro array analysis and cluster analysis.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 3 | 2 | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO5** | 2 | - | - | - | 1 | - | - | - | - | - | - | - |

| **08OExxx** | **SUPPLY CHAIN MANAGEMENT** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To provide a conceptual understanding of a supply chain and its significance and to explain the issues while designing, planning or operating a supply chain.
- To introduce the logistical drivers including sourcing that determine the performance of any supply chain and to describe the role that sourcing plays in the supply chain.
- To familiarize about designing a distribution network and to enable the students to develop a framework for making network design decisions.
- To disseminate the knowledge regarding the components of demand forecasting and on balancing the appropriate costs and cycle inventory in a supply chain.
- To impart knowledge on supply chain integration, the impact of Bullwhip effect, SC restructuring and to expose specialized supply chains including agile, reverse and agro supply chains.

**UNIT - I**

Supply Chain – Fundamentals –Evolution- Role in Economy - Importance - Decision Phases - Supplier- Manufacturer-Customer chain - Enablers/ Drivers of Supply Chain Performance -Supply chain strategy - Supply Chain Performance Measures.

**UNIT - II**

Outsourcing – Make Vs buy - Identifying core processes - Market Vs Hierarchy - Make Vs buy continuum - Sourcing strategy: Portfolio Approach - Reconfiguration of the Supply Base -Impact of the internet on Sourcing Strategy.

**UNIT - III**

Distribution Network Design – Role - Factors Influencing Distribution Network Design – Design Option for a Distribution Network – E-Business and the Distribution Network – Network Design in Supply Chain – Role - Factors Influencing Network Design Decisions – Framework for Network Design Decisions - Impact of uncertainty on Network Design.

**UNIT - IV**

Demand Forecasting in a Supply Chain – The Role of Forecasting in a Supply Chain – Characteristics - Components – Risk Management in Forecasting – Managing Economies of Scale in a Supply Chain - Role – Economies of Scale to Exploit Fixed Costs – Estimating Cycle Inventory- Managing supply chain cycle inventory - Uncertainty in the supply chain.

**UNIT - V**

Supply Chain Integration - Building partnership and trust in SC Value of Information: Bullwhip Effect - Effective forecasting - Coordinating the supply chain - SC Restructuring - SC Mapping - SC process restructuring, Postpone the point of differentiation – IT in Supply Chain - Agile Supply Chains -Reverse Supply chain - Agro Supply Chains.

**Text Books:**

1. Janat Shah, "Supply Chain Management – Text and Cases", Pearson Education, 2009.
2. Sunil Chopra and Peter Meindl, "Supply Chain Management-Strategy Planning and Operation", PHI Learning / Pearson Education, 2007.

**Reference Books:**

1. Ballou Ronald H, "Business Logistics and Supply Chain Management", Pearson Education, 5th Edition, 2007.
2. David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, "Designing and Managing the Supply Chain: Concepts, Strategies, and Cases", Tata McGraw-Hill, 2005.
3. Altekar Rahul V, "Supply Chain Management-Concept and Cases", PHI, 2005.
4. Shapiro Jeremy F, "Modeling the Supply Chain", Thomson Learning, Second Edition, 2006.
5. Joel D. Wisner, G. Keong Leong, Keah-Choon Tan, "Principles of Supply Chain Management- A Balanced Approach", South-Western, Cengage Learning, 2008.

**Course Outcomes**:

At the end of this course, the students will be able to

1. Identify the goal of supply chain and understand the impact of supply chain decisions on the success of a firm.
2. Analyse the key sourcing related decisions and review the impact of the internet on outsourcing.
3. Identify designs for distribution networks and apply the ideas to develop a framework for making network design decisions.
4. Describe and demonstrate the historical demand information for forecasting the future demand.
5. Create and implement a supply chain and build specialized supply chains including agile, reverse and agro supply chains.

| **Mapping of Course Outcomes with Programme Outcomes** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | 1 | - | - | - | - | - | 1 | - | - | - | - |
| **CO3** | 1 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 1 | - | - | - | 2 | - | - | - | - | - | 1 | - |
| **CO5** | 1 | - | 1 | 1 | - | 1 | - | - | - | - | - | - |

| 08OExxx | CYBER FORENSICS | L | T | P |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To provide basic knowledge and services of Computer Forensics.
- To impart knowledge on data and validate Forensics Data.
- To describe the tools and tactics associated with Cyber Forensics.
- To enable the students to aware about crime and legal issues.
- To familiarize the students for developing Forensic Capabilities.

**UNIT - I**

Introduction: Computer Forensics Fundamentals – Types of Computer Forensics Technology – Types of Computer Forensics Systems - Vendor and Computer Forensics Services.

**UNIT - II**

Computer forensics evidence and capture: Data Recovery – Evidence Collection and Data Seizure – Duplication and Preservation of Digital Evidence – Computer Image Verification and Authentication.

**UNIT - III**

Computer forensic analysis: Discover of Electronic Evidence – Identification of Data – Reconstructing Past Events - Fighting against Macro Threats – Information Warfare Arsenal - Tactics of the Military - Tactics of Terrorist and Rogues – Tactics of Private Companies.

**UNIT - IV**

Information warfare: Arsenal – Surveillance Tools - Hackers and Theft of Components - Contemporary Computer Crime - Identity Theft and Identity Fraud - Organized Crime & Terrorism - Avenues Prosecution and Government Efforts - Applying the First Amendment to Computer Related Crime - The Fourth Amendment and other Legal Issues.

**UNIT - V**

Computer forensic cases: Developing Forensic Capabilities - Searching and Seizing Computer Related Evidence -Processing Evidence and Report Preparation - Future Issues.

**Text Books:**

1. John R. Vacca, "Computer Forensics: Computer Crime Scene Investigation", Cengage Learning, 2nd Edition, 2005. (CHAPTERS 1 – 18). (UNIT I – IV)
2. Marjie T Britz, "Computer Forensics and Cyber Crime: An Introduction", Pearson Education, 2nd Edition, 2008. (CHAPTERS 3 – 13). (UNIT IV – V)

**Reference Books:**

1. Marie-Helen Maras, "Computer Forensics: Cybercriminals, Laws, and Evidence", Jones & Bartlett Learning; 2nd Edition, 2014.
2. Chad Steel, "Windows Forensics", Wiley, 1st Edition, 2006.
3. Majid Yar, "Cybercrime and Society", SAGE Publications Ltd, Hardcover, 2nd Edition, 2013.
4. Robert M Slade, "Software Forensics: Collecting Evidence from the Scene of a Digital Crime", Tata McGraw Hill, Paperback, 1st Edition, 2004.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the present indicators that a Cyber Security incident has occurred.
2. Evaluate and verify the Computer Forensic Evidence.
3. Analyze the Criminal Justice Methods to Cyber Security and Computer Forensic Investigations.
4. Understand tools, components and legal issues on computer Forensics
5. Develop the Forensic Capabilities and prepare the report based on evidence.

| Mapping of Course Outcomes with Program Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | - | - | - | 1 | - | - | - | - |
| **CO2** | 1 | 2 | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 2 | 1 | 1 | - | 1 | - | - | - | - | - | - |
| **CO4** | 1 | - | - | - | 3 | - | - | - | - | - | - | - |
| **CO5** | 1 | - | 2 | - | - | - | 1 | - | - | - | - | - |

| **08OExxx** | **SYSTEM MODELING AND SIMULATION** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To introduce the terms in simulation and explain the types and applications of simulation.
- To explain the types of distributions, concepts of queuing systems and Markovian models.
- To impart the statistical knowledge required for system modelling.
- To teach the steps in model building.
- To present the use of tools for simulation.

**UNIT - I**

Introduction – Simulation Terminologies- Application areas – Model Classification – Types of Simulation- Steps in a Simulation study- Concepts in Discrete Event Simulation – Monte Carlo Simulation - Simulation Examples.

**UNIT - II**

Statistical Models - Concepts – Discrete Distribution- Continuous Distribution – Poisson Process- Empirical Distributions- Queueing Models – Characteristics- Notation – Queueing Systems – Markovian Models- Properties of random numbers- Generation of Pseudo Random numbers- Techniques for generating random numbers-Testing random number generators- Generating Random-Variates- Inverse Transform technique – Acceptance- Rejection technique – Composition and Convolution Method.

**UNIT - III**

Input Modeling - Data collection - Assessing sample independence - Hypothesizing distribution family with data - Parameter Estimation - Goodness-of-fit tests - Selecting input models in absence of data- Output analysis for a Single system – Terminating Simulations – Steady state simulations.

**UNIT - IV**

Model Building – Verification of Simulation Models – Calibration and Validation of Models – Validation of Model Assumptions – Validating Input – Output Transformations.

**UNIT - V**

Simulation Tools – Model Input – High level computer system simulation – CPU – Memory Simulation – Comparison of systems via simulation – Simulation Programming techniques - Development of Simulation models – Simulation Project Management.

**Text Books:**

1. Banks J and John Carson, "Discrete Event System Simulation", Pearson Education, 2010.
2. Geoffrey Gordon, "System Simulation", Second Edition, PHI, 2006.

**Reference Books:**

1. Kelton, WD, Sadowski, R, Zupick, Simulation with Arena, McGraw-Hill, 2014.
2. Frank L. Severance, "System Modeling and Simulation", Wiley, 2001.
3. Averill M. Law and W.David Kelton, "Simulation Modeling and Analysis, Third Edition, McGraw Hill, 2006.
4. Jerry Banks, "Handbook of Simulation: Principles, Methodology, Advances, Applications and Practice", Wiley, 1998.
5. Altiok, T, Melamed, B , Simulation Modeling and Analysis with Arena, Academic Press, 2007.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Describe the types of simulation and the steps in simulation.
2. Apply distribution, queuing and Markovian models.
3. Select models for simulation.
4. Test simulation models.
5. Choose tools for simulation.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 1 | - | 2 | - | - | - | - | - | -- | - | - |
| **CO3** | 2 | 1 | - | 2 | 1 | - | - | - | - | - | - | - |
| **CO4** | 1 | - | - | 2 | - | - | - | - | - | - | - | - |
| **CO5** | 1 | - | - | - | 2 | - | - | - | - | - | - | - |

| **08OExxx** | **DATA ANALYTICS** | **L** | **T** | **P** |
|---|---|---|---|---|
| | | 4 | 0 | 0 |

**Course Objectives:**

- To introduce the fundamentals of data science, big data analytics and its applications.
- To familiarize R programming to write simple programs.
- To impart programming skills on Map Reduce processing technique.

- To illustrate the concept of data analysis techniques with case studies.
- To develop the skills required to perform data visualization.

**UNIT - I**

Introduction: Data science process – roles, stages in data science project – State of the practice in analytics – Role of data scientists – Key roles for successful analytic project – Main phases of life cycle – Working with data from files – Exploring data – Managing data – Cleaning and sampling for modeling and validation – Challenges of conventional systems – Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting – Modern data analytic tools. Introduction to Big Data Platform – Big Data and its importance, Five Vs, Drivers for Big data, Big data analytics, Big data applications.

**UNIT - II**

R Programming: R basics – Reading and getting data into R – Ordered and unordered factors – Arrays and matrices – Lists and data frames – Reading data from files – Probability distributions – Statistical models in R – Manipulating objects – Data distribution – Simple programs using R.

**UNIT - III**

Map Reduce: Introduction – Distributed file system – Algorithms using map reduce, Matrix–Vector Multiplication by Map Reduce – Hadoop – Understanding the Map Reduce architecture – Writing Hadoop Map Reduce Programs – Loading data into HDFS – Executing the Map phase – Shuffling and sorting – Reducing phase execution.

**UNIT - IV**

Data Analysis Techniques: Linear and logistic regression modeling – Naïve Baye's classifier – Support vector machine – Neural networks – Principal component analysis – Linear Discriminant Analysis – Decision Trees – Fuzzy logic – Clustering Techniques : Hierarchical, agglomerative, K–Means – Associative Rule Mining.

Case Studies: Social Network Analysis – Text analysis –Marketing analysis.

**UNIT - V**

Data Visualization: Documentation and deployment – Producing effective presentations – Introduction to graphical analysis – plot() function – Displaying multivariate data – Matrix plots – Multiple plots in one window – Exporting graph – Using graphics parameters – Visualizations – Visual data analysis techniques, interaction techniques; Systems and applications.

**Text Books:**

1. Nina Zumel, John Mount, “Practical Data Science with R”, Manning Publications, 2014.
2. Chris Eaton, Dirk deroos et al. , “Understanding Big data ”, McGraw Hill, 2012.

**Reference Books:**

1. Mark Gardener, “Beginning R - The Statistical Pr ogramming Language”, John Wiley & Sons, Inc., 2012.
2. Boris lublinsky, Kevin t. Smith, Alexey Yakubovich, “Professional Hadoop Solutions”, Wiley, 2015.
3. David Hand, Heiki Mannila, Padhria Smyth, “Principles of Data Mining”, PHI 2013.
4. Nathan Yau, “Visualize This: The Flowing Data Guide to Design, Visualization, and Statistics”, Wiley, 2011.

5. Tony Ojeda, Sean Patrick Murphy, Benjamin Bengfort, Abhijit Dasgupta, "Practical Data Science Cookbook", Packt Publishing Ltd., 2014.
6. W. N. Venables, D. M. Smith and the R Core Team, "An Introduction to R", 2013.
7. Tom White, "HADOOP: The definitive Guide" , O Reilly 2012.
8. Jure Leskovec, Anand Rajaraman, Jeffrey D. Ullman, "Mining of Massive Datasets", Cambridge University Press, 2014.
9. Stephan Sorger, "Marketing Analytics: Strategic models and metrics", Create Space Independent Publishing Platform, First Edition, 2013.
10. Jiawei Han and Micheline Kamber, "Data Mining: Concepts and Techniques", Morgan Kaufmann Publishers, Third Edition, 2010.
11. Lior Rokach and Oded Maimon, "Data Mining and Knowledge Discovery Handbook", Springer, Second Edition, 2010.
12. Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006.
13. Jared Dean, "Big Data, Data Mining, and Machine Learning: Value Creation for Business Leaders and Practitioners", Wiley India Private Limited, 2014.
14. Borgatti, S. P., Everett, M. G., & Johnson, J. C., "Analyzing social networks", SAGE Publications Ltd., First Edition, 2013.


**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the fundamentals of data science, big data analytics and its applications.
2. Solve simple problems using R programming.
3. Implement Map Reduce processing technique.
4. Build applications with suitable data analysis technique.
5. Perform data visualization for graphical analysis.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | - | 2 | - | - | - | - | - | - | 2 |
| **CO3** | 1 | - | 1 | - | 2 | - | - | - | - | - | - | - |
| **CO4** | 3 | 2 | 2 | 2 | 1 | 1 | - | - | - | - | - | - |
| **CO5** | 2 | 2 | 1 | 2 | 1 | - | - | - | - | - | - | 1 |

| **08OExxx** | **SOCIAL NETWORK ANALYSIS** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the concept of semantic web and related applications.
- To teach knowledge representation using ontology.
- To explain about communities in social network.
- To impart the knowledge of human behavior in social web and related communities.
- To develop the skills required to visualize social networks.

**UNIT - I**

Introduction – Development of Semantic Web - Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis

**UNIT - II**

Ontology-based knowledge Representation –Resource Description Framework – Web Ontology Language - Modeling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals – Ontological representation of social relationships - Aggregating and reasoning with social network data – Advanced representations.

**UNIT - III**

Extracting evolution of Web Community from a Series of Web Archive – Detecting communities in social networks – Evaluating communities – Methods for community detection and mining – Applications of community mining algorithms – Tools for detecting communities social network infrastructures and communities – Decentralized online social networks.

**UNIT - IV**

Understanding and predicting human behavior for social communities – User data management - Inference and Distribution – Enabling new human experiences – Reality mining – Context – Awareness - Privacy in online social networks – Trust models based on subjective logic – Trust network analysis – Trust transitivity analysis – Combining trust and reputation – Trust derivation based on trust comparisons – Attack spectrum and countermeasures.

**UNIT - V**

Graph theory – Centrality – Clustering – Node - Edge Diagrams – Matrix representation – Visualizing online social networks, Visualizing social networks with matrix - based representations – Matrix and Node-Link Diagrams – Hybrid representations – Applications – Cover networks – Community welfare - Collaboration networks – Co-Citation networks.

**Text Books:**

1. Borko Furht, “Handbook of Social Network Technologies and Applications”, Springer, 1st Edition, , 2010.
2. Peter Mika, “Social Networks and the Semantic Web”, Springer , First Edition, 2007.

**Reference Books:**

1. Guandong Xu, Yanchun Zhang and Lin Li, “Web Mining and Social Networking – Techniques and applications”, Springer , First Edition, 2011.
2. Dion Goh and Schubert Foo, “Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively”, IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé -Dupuy, “Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling”, IGI Global Snippet, 2009.
4. John G Breslin, Alexander Passant and Stefan Decker, “The Social Semantic Web”, Springer, 2009.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the concept of semantic web and related applications.

2. Represent knowledge using ontology.
3. Identify communities in social network.
4. Analyze human behavior in social web and related communities.
5. Develop the visualization diagrams for social networks

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | 1 | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | - | 2 | 1 | - | - | - | - | - | - |
| **CO3** | 1 | - | - | - | 2 | 1 | - | - | - | - | - | - |
| **CO4** | 2 | - | - | - | - | 1 | - | - | - | - | - | - |
| **CO5** | 2 | 1 | 1 | - | 2 | 1 | - | - | - | - | - | - |

| **08OExxx** | **ORGANIZATIONAL BEHAVIOUR AND MANAGEMENT** | **L** | **T** | **P** |
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**Course Objectives:**

- To impart knowledge on organizational behavior and managerial skills.
- To educate about personality development and effects on work behavior.
- To teach the consequences in team building and conflict management.
- To guide the students on leadership styles and organization politics.
- To motivate them about stress management and gender sensitiveness at workplace.

**UNIT - I**

Organizational Behavior: Introduction – Definition, Need and Importance of Organizational Behavior - Nature and Scope – Framework of Organizational Behavior models. Management: Introduction - Meaning and Nature of management – Management Systems and Processes – Tasks and Responsibilities of a Professional Manager – Managerial skills.

**UNIT - II**

Individual Behavior: Personality – Types – Factors influencing personality theories. Learning: Types of learners – The learning process – Learning Theories – Organizational Behavior Modification - Misbehavior: Types – Management Intervention - Emotions: Emotional Labor – Emotional Intelligence – Theories - Attitudes: Characteristics – Components – Formation – Measurement – Values - Perceptions: Importance – Factors influencing Perception – Interpersonal Perception – Impression Management - Motivation: Importance – Types – Effects on Work Behavior.

**UNIT - III**

Group Behavior: Organization Structure – Formation – Groups in Organizations – Influence – Group Dynamics – Group Decision making Techniques – Team Building – Interpersonal Relations – Communication – Control – Conflict Management – Nature of Conflict – Types of Conflict.

**UNIT - IV**

Leadership and Power: Leadership – Meaning – Importance Traits – Leadership Styles – Behavioral and Contingency Theories – Leaders vs. Managers – Sources of Power – Power Centers – Organization Politics.

**UNIT - V**

Dynamics of Organizational Behavior: Organizational Culture and Climate – Factors affecting Organizational Climate – Importance - Job Satisfaction: Determinants – Measurements – Influence on Behavior - Organizational Change: Importance – Stability vs. Change – Proactive vs. Reaction Change – the Change Process – Resistance to Change – Managing Change - Stress: Work Stressors – Prevention and Management of Stress – Balancing Work and Life. Organizational Development: Characterizes – Objectives – Developing Gender sensitive Workspace.

**Text Books:**

1. Stephen P. Robbins, "Organizational Behavior", Prentice Hall of India, Eleventh Edition, 2008.
2. Fred Luthans, "Organizational Behavior", McGraw Hill, Eleventh Edition, 2001

**Reference Books:**

1. Udai Pareek, "Understanding Organizational Behavior", Oxford Higher Education, Third Edition, 2011.
2. Mc Shane & von Glinov, "Organizational Behavior", Tata McGraw Hill, Fourth Edition, 2007.
3. Nelson, Quick, Khandelwal, "ORGB – An Innovative Approach to Learning and Teaching", Cengage learning, Second Edition, 2012.
4. Jerald Greenberg, "Behavior in Organization", PHI Learning, Tenth Edition, 2011.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Relate organizational behavior with managerial skills.
2. Develop the personality traits and understand the work behavior.
3. Construct team building and handle conflict management in it if arise.
4. Improve leadership styles and organization politics.
5. Predict stress at workplace and prevent it at an earliest.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 2 | 2 | 1 | 2 | - | 1 | - | 1 | 1 | - | - | - |
| **COl** | 2 | 2 | 1 | 2 | - | 1 | - | 1 | 2 | - | - | - |
| **CO4** | 2 | 1 | 1 | 1 | - | 1 | - | 1 | - | - | - | 1 |
| **CO5** | 2 | 3 | 1 | 2 | - | 1 | - | - | - | - | - | - |

| **08OExxx** | **PRODUCT DESIGN** | **L** | **T** | **P** |
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**Course Objectives:**

- To familiarize the students about the aspects of product design and development
- To enhance the customer needs and product specifications
- To develop the skills required to product development and design

- To provide basic knowledge about the costs of product development
- To illustrate the concepts of Quality control and reliability of product

**UNIT - I**

Introduction: Significance of product design- challenges of product design- product design and development process-sequential engineering design method- the challenges of product development-Identifying opportunities evaluate and prioritize projects-allocation of resources.

**UNIT - II**

Identifying customer needs and product Specifications: Competitor and customer –behavior analysis-understanding customer-involve customer in development and managing requirements-Interpret raw data in terms of customers need-organize needs in hierarchy - establish the relative importance of needs-Establish target specifications- setting final specifications .

**UNIT - III**

Product Development: Detailed design- Analysis and modeling- Best practices for detailed design-Design analysis-Prototypes in Detailed Design-Test and Evaluation-Design review, prototyping-simulation and testing-manufacturing-strategies-planning and methodologies.

**UNIT - IV**

Costs for product Development**:** Sources of funds for development cost - product costs- Estimating product costs- kinds of cost procedures- value Engineering- Cost reduction.

**UNIT - V**

Quality Control and reliability: Quality control procedure-Inspection and test equipment-statistical quality control-manufacturing reliability- probability of tool reliability-reliability operations-developing a quality-control and reliability programme**.**

**Text Books:**

1. Karl Ulrich, Steven Eppinger, "Product Design and Development", Tata McGraw Hill,6th Edition, 2015
2. Alex Milton, Paul Rodgers, "Product Design", Laurence King Publishing, 2011

**Reference Books:**

1. Niebel B.W and Draper A.B., "Product design and process Engineering", McGraw Hill Book Company, New York, 1974.
2. Stephen C.Armstrong, "Engineering and product development management – the holistic Approach", Cambridge University press, 2005.
3. Zaidi.A., "SPC Concepts-Methodologies and Tools", Prentice Hall of India Pvt Ltd.,
4. Kevin Otto, "Product design", Pearson Education Limited, 2007.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the Significance of product design and development process
2. Identify the customer needs and product Specification
3. Analyze the methodologies for product design, development and management
4. Identify the Sources of funds for development cost
5. Understand the quality control procedures and reliability issues in manufacturing industry.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | 1 | 1 | - | - | - | - | - | 1 | - | - |
| **CO2** | 1 | 1 | - | 1 | - | - | - | - | - | - | - | - |
| **CO3** | - | 1 | 1 | - | - | - | - | - | - | 1 | - | - |
| **CO4** | 1 | 1 | - | 1 | - | - | - | - | - | - | 1 | - |
| **CO5** | 1 | - | 1 | - | - | - | - | - | - | - | - | - |

| **08OExxx** | **EMBEDDED SYSTEMS** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the basics of embedded systems.
- To educate the students on real time operating system based embedded system design.
- To teach the components of embedded systems, data flow graphs, measurement driven performance analysis, program validation and testing.
- To explain the need of networks and multiprocessors including categories of multiprocessors and distributed embedded systems.
- To encourage the students on case studies based on applications of embedded System.

**UNIT - I**

Introduction To Embedded Systems: Introduction, Applications of embedded system, Features and Attributes of Embedded System, Challenges in Embedded System, Selection of Processors, Recent trends in embedded system, embedded development life cycle.

**UNIT - II**

Real Time Operating System: Prime Movers: Real time without RTOS, Task states, Task table and data–Multitasking operating systems–Context switches–Kernels–Task swapping methods–Scheduler algorithms –Interprocess communication mechanism-memory communication, Message passing, Signals.

**UNIT - III**

Program Design And Analysis: Components for embedded programs-State machines, Stream-oriented programming circular buffers, Queues-Models of programs: Data flow graphs, Control/Data flow graphs-Assembly, Linking and Loading- Basic compilation techniques- Program-level performance analysis: elements of program performance, measurement-driven performance analysis-Program validation and Testing.

**UNIT - IV**

Networks And Multiprocessors: Need of networks and multiprocessors – Categories of Multiprocessors – Distributed embedded system: Network abstractions, CAN bus, Distributed computing in cars and airplanes, $I^2C$ bus, Ethernet, Internet- MPSoCs and shared memory multiprocessors: Heterogeneous shared memory multiprocessors, Accelerators, Accelerator performance analysis, Scheduling and allocation.

**UNIT - V**

Embedded System Application Development: Case study of: Data compressor, Model train controller, Video accelerator, Audio player, Air -bag system.

**Text Books:**

1. Marilyn Wolf, "Computers as Components-Principles of Embedded Computing System Design", Morgan Kaufmann Publishers, Third edition, 2012.
2. Wayne Wolf, "Computers as Components, Principles of Embedded Computing System Design", Morgan Kaufmann Publishers, Second edition, 2008.

**Reference Books:**

1. Shibu K.V, "Introduction to Embedded System", Tata McGraw-Hill, 2009.
2. David E. Simon, "An Embedded Software Primer", Pearson Education Asia, Addison Wesley, 2001.
3. Rajkamal, "Embedded Systems", Architecture, Programming and Design", Tata McGraw Hill, 2003.
4. Steve Heath, "Embedded Systems Design",(2ED), Newnes /An imprint of Elsevier, 2005

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the features and design/development of embedded system.
2. Develop an embedded system using RTOS.
3. Analyze the components of embedded systems for designing data flow graphs for measuring the performance analysis, validation and testing.
4. Design distributed embedded systems and shared memory multiprocessors with heterogeneous shared memory multiprocessors, accelerators for accelerator performance analysis, scheduling and allocation.
5. Design an embedded system application.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 1 | - | - | - | - | - | - | - | - | - |
| **CO3** | 2 | 1 | - | - | - | - | - | - | - | - | - | - |
| **CO4** | 3 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| **CO5** | 3 | - | 2 | - | 2 | 1 | - | - | - | - | - | 2 |

| **08OExxx** | **KNOWLEDGE MANAGEMENT** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce the basic concepts of knowledge management.
- To impart knowledge about knowledge management life cycle and Architecture.
- To provide basic knowledge of Capturing knowledge and Fuzzy reasoning.

- To familiarize the knowledge codification and knowledge testing.
- To explain about knowledge transfer methods, Neural network, Data mining and knowledge management protocols.

**UNIT - I**

Knowledge Management: KM Myths – KM Life Cycle – Understanding Knowledge – Knowledge, intelligence –Experience – Common Sense – Cognition and KM – Types of Knowledge – ExpertKnowledge – Human Thinking and Learning.

**UNIT - II**

Knowledge Management System Life Cycle : Challenges in Building KM Systems – Conventional vs KM System Life Cycle (KMSLS)– Knowledge Creation and Knowledge Architecture – Nonaka's Model of KnowledgeCreation and Transformation- Knowledge Architecture.

**UNIT - III**

Capturing Knowledge : Evaluating the Expert – Developing a Relationship with Experts – Fuzzy Reasoning andthe Quality of Knowledge – Knowledge Capturing Techniques - Brain Storming – ProtocolAnalysis – Consensus Decision Making – Repertory Grid-Concept Mapping –Blackboarding.

**UNIT - IV**

Knowledge Codification: Modes of Knowledge Conversion – Codification Tools and Procedures – KnowledgeDeveloper's Skill Set – System Testing and Deployment – Knowledge Testing – Approaches to Logical Testing - User Acceptance Testing – KM System DeploymentIssues – User Training – Post Implementation.

**UNIT - V**

Knowledge Transfer And Sharing: Transfer Methods – Role of the Internet – Knowledge Transfer in e-world – KM SystemTools – Neural Network – Association Rules – Classification Trees – Data Mining andBusiness Intelligence – Decision Making Architecture – Data Management – KnowledgeManagement Protocols – Managing Knowledge Workers.

**Text Books:**

1. Elias. M. Award & Hassan M. Ghaziri, "Knowledge Management" , Pearson Education, Second Edition, 2008.
2. Stuart Barnes, "Knowledge Management Systems – Theory and Practice", Cengage Learning, 2002.

**Reference Books:**

1. Guus Schreiber, Hans Akkermans, AnjoAnjewierden, Robert de Hoog, NigelShadbolt, Walter Van de Velde and Bob Wielinga, "Knowledge Engineering and Management", Universities Press, Second Edition, 2001.
2. C.W. Holsapple, "Handbooks on Knowledge Management", International Handbooks on Information Systems, Vol. 1 and 2, 2003.
3. Irma Becerra Fernandez, Rajiv Sabherwal, "Knowledge Management: Systems and Processes", Routledge , Second Edition, 2015.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire the basic concepts in knowledge management.
2. Understand the concepts of knowledge management life cycle and architecture.
3. Implement knowledge capturing techniques and Fuzzy reasoning using knowledge management.
4. Design knowledge codification and knowledge testing.
5. Understand the basic concepts of knowledge transfer methods, Neural network, Data mining and knowledge management protocols.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | 1 | - | - | - | - | - | - | - | - |
| **CO2** | 3 | - | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO3** | 2 | - | - | 1 | - | - | - | - | - | - | - | - |
| **CO4** | 2 | 2 | 2 | - | 1 | - | - | - | - | - | - | - |
| **CO5** | 3 | 2 | - | - | 2 | - | - | - | - | - | - | - |

| **08OExxx** | **PROJECT MANAGEMENT** | **L** | **T** | **P** |
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**Course Objectives:**

- To understand the activities in project management
- To learn about how to assess the projects and to find the cost of the project using cost benefit evaluation techniques
- To impart knowledge on project scheduling, monitoring and control.
- To learn about contract management.
- To study about managing people and teams.

**UNIT - I**

Project Definition – Contract Management – Activities Covered By Software Project Management – Overview of Project Planning – Stepwise Project Planning.

**UNIT - II**

Strategic Assessment – Technical Assessment – Cost Benefit Analysis – Cash Flow Forecasting – Cost Benefit Evaluation Techniques – Risk Evaluation.

**UNIT - III**

Objectives – Project Schedule – Sequencing and Scheduling Activities – Network Planning Models – Forward Pass – Backward Pass – Activity Float – Shortening Project Duration – Activity on Arrow Networks – Risk Management – Nature Of Risk – Types Of Risk – Managing Risk – Hazard Identification – Hazard Analysis – Risk Planning And Control.

**UNIT - IV**

Creating Framework – Collecting The Data – Visualizing Progress – Cost Monitoring – Earned Value – Priortizing Monitoring – Getting Project Back To Target – Change Control – Managing Contracts – Introduction – Types Of Contract – Stages In Contract Placement – Typical Terms Of A Contract – Contract Management – Acceptance.

**UNIT - V**

Introduction – Understanding Behaviour – Organizational Behaviour: A Background – Selecting The Right Person For The Job – Instruction In The Best Methods – Motivation – The Oldman – Hackman Job Characteristics Model – Working In Groups – Becoming A Team –Decision Making – Leadership – Organizational Structures – Stress –Health And Safety – Case Studies.

**Text Books:**

1. Bob Hughes, Mike Cotterell, Rajib Mall "Software Project Management", Fifth Edition, Tata McGraw Hill, 2011.
2. Gopalaswamy Ramesh, "Managing Global Software Projects", Tata McGraw Hill, New Delhi,2006.

**Reference Books:**

1. Pankaj Jalote, "Software Project Management in Practice", Pearson Education, reprinted 2009.
2. Walker Royce, "Software Project Management", Pearson Education, 2002.
3. Kelkar Sa, "Software Project Management", PHI Learning, New Delhi, 2013.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the basic concepts of software project and project planning.
2. Apply cost benefit evaluation techniques to find the cost of the project and to evaluate the risk of project.
3. Analyse the activity plan for a project and to estimate the overall duration of a project
4. Monitor the progress of projects and to assess the contract management.
5. Identify the factors that influence people's behavior in a project environment and selection of appropriate people for the project and to improve group working.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | 1 | - | - | 1 | - | - | - | - | 3 | - |
| **CO2** | 1 | 2 | 1 | - | - | - | - | - | - | 2 | 3 | - |
| **CO3** | 1 | 2 | 1 | - | - | - | - | - | - | - | 3 | - |
| **CO4** | 1 | - | 1 | - | - | - | - | - | 2 | - | 3 | - |
| **CO5** | 1 | - | 1 | - | - | - | - | - | 2 | - | 3 | - |

| 07OExxx | BIOLOGY FOR ENGINEERS | L | T | P |
|---|---|---|---|---|
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**Course Objectives:**

- To provide basic understanding of biological mechanisms of living systems from engineering perspective.
- To understand the behavior of biological system and their adaptation.
- To learn the biological system stress and their response.
- To explain the coordination and cooperation activities of biological system.
- To familiarize the Scaling Factors and Biological Engineering Solutions

**UNIT I**

**Requirements of Biological Systems**

Biological Units Need Water; Biological Units Need the Right Amount of Oxygen; Biological Units Need Food and Nutrients; Biological Units Become Ill in the Presence of Wastes; Biological Units Need Heat Sources and Sinks.

**UNIT II**

**Behavior of Biological Systems**

Biological Units Adapt to Their Environments; Biological Units Modify Their Environments; Adaptations Require Extra Energy and Resources; Biological Units, If Possible, Move to Friendlier Environments; Biological Units Evolve under Environmental Pressures.

**UNIT III**

**Response to Stress by Biological Systems**

Crowding of Biological Units Produces Stress; Biological Units Are Affected by Chemical Stresses; Biological Units Respond to Mechanical Stresses; Optimization Is Used to Save Energy and Nutrient Resources; Biological Units Alter Themselves to Protect against Harsh Environments.

**UNIT IV**

**Existence of Biological Systems**

Biological Units Cooperate with Other Biological Units; Biological Units Compete with Other Biological Units; Biological Units Reproduce; Biological Units Coordinate Activities through Communication; Biological Units Maintain Stability with Exquisite Control; Biological Units Go through Natural Cycles; Biological Units Need Emotional Satisfaction and Intellectual Stimulation; Biological Units Die.

**UNIT V**

**Scaling Factors and Biological Engineering Solutions**

Allometric Relationships from Evolutionary Pressure; Dimensional Analysis; Golden Ratio; Fractal Scaling within an Organism; Self-Similarity for Tissues and Organs; Self-Similarity in Populations; Systems Approach; Relationships between Engineering and Biology; The Completed Design.

**Text Book:**

1. Arthur T. Johnson, " Biology for Engineers", CRC Press, 2010

**Reference Books:**

1. Aydin Tözeren, Stephen W. Byers, New Biology for Engineers and Computer Scientists, Pearson/Prentice Hall, 2004

2. S. Thyaga Rajan, N. Selvamurugan, M. P. Rajesh, R. A. Nazeer, Richard W. Thilagaraj, S. Barathi, and M. K. Jaganathan, "Biology for Engineers," Tata McGraw-Hill, New Delhi, 2012.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Acquire knowledge in the concept of biological system from engineering perspective.
2. Understand the behavior of biological system and their adaptation.
3. Analyze the biological system stress and their response.
4. Implement the coordination and cooperation activities of biological system.
5. Evaluate theScaling Factors and Biological Engineering Solutions.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 1 | - | - | - | - | - | - | - | - | - | - | - |
| **CO3** | 1 | 2 | 2 | - | - | - | - | - | - | - | - | - |
| **CO4** | 1 | - | - | - | 2 | - | - | - | - | - | - | - |
| **CO5** | 1 | - | 2 | 2 | - | - | - | - | - | - | - | - |

| **02OEXXX** | **DISASTER MANAGEMENT** | **L** | **T** | **P** |
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**Course objectives:**

- To teach the basic concepts of disasters and also gives a thorough knowledge and experience to reduce disaster risks
- To evaluate the case studies of important Indian earthquakes
- To educate the student to learn causes of Tsunami and the techniques for reducing landslide hazards
- To develop the skills required to safety measures during and before cyclones.
- To illustrate the Intensification of hazards due to human interference

**UNIT I**

Introduction – Disaster- Characteristics and types of Disasters- Causes and effects of Disaster -Risk- Vulnerability – Preparedness- Disaster mitigation and disaster management- Classification of mitigation measures-Vulnerability Analysis- Observation and Perception of Vulnerability- Socio-Economic Factors of Vulnerability- Vulnerability in India- Disaster related policy goals of UNDP UNDRO and Govt. of India- Appraising disaster needs- Needs for technical expertise- Role of various Agencies in Disaster Management and Development -Disaster risk reduction planning- Role of Developmental Planning for disaster Management

**UNIT II**

Earthquake - Cause of Earthquake- General characteristics- Measuring Earthquakes- Distribution pattern of Earthquakes in India- Earthquake prone areas- case studies of important Indian earthquakes

- Forecasting techniques and risk analysis- Possible risk reduction measures- earthquake resistance buildings and re-engineering techniques in India.

**UNIT III**

Tsunamis- Causes of a Tsunami- General Characteristics- Tsunami warning system-Distribution pattern of Tsunami in India- Possible risk reduction measures- Integrated coastal zone management.
Landslides- Rock falls- Avalanches- Mud flows and glaciers- Landslides and rock falls- landslide hazard zonation- Instrumentation and monitoring- Techniques for reducing landslide hazards.

**UNIT IV**

Tropical cyclones- Structure of tropical cyclones- Nature of tropical cyclones- Cyclone experience in India and Tamilnadu- Preparedness- Tropical cyclones and their warning systems- Tropical cyclone warning strategy in India special nature of the problem in the region- Classification- Protection of buildings from cyclones of India- Precautions during and before cyclones.

**UNIT V**

Coastal floods- Intensification of hazards due to human interference- Management-River and coastal floods- Temperature extremes and wild fires- Physiological hazards- Flood forecasting-mitigation-planning- management- flood prone areas the Indian scenario- Flood experience in India and Tamilnadu.
Environmental hazards- Typology- Assessment and response- Strategies -The scale of disaster-Vulnerability- Disaster trends- Paradigms towards a balanced view- Chemical hazards and toxicology-Biological hazards- Risk analysis- Other technological disasters.

**Text Books:**

1. David R. Godschalk (Editor), Timothy Beatiey, Philip Berke,.David J. Browt:r, Edward J. Kaiser Charles C. Boh, R. Matthew Goebel, Natural Hazard Mitigation: Recasting Disaster Policy and Planning Island Press; (January 1999), ISBN) 559636025
2. Sinha, P.C. Wind & Water Driven Disasters, 1998, 250pp, Anmol Publications.

**Reference Books:**

1. Davide Wikersheimer, “Windstorm Mitigation Manual for Light Frame Construction”, DIANE Publishing Co: (Paperback-May 1997)
2. Brown D, Redevelopment After the Storm: Hazard Mitigation Opportunities in the Post Disater Setting. (Paperback – June 1985) Publisher: John Wiley & Sons ISBN:047191505X
3. Sinha, P.C. Technological Disasters , 1997, 516 pp Anmol Publications Trivedi,

**Course Outcomes:**

At the end of this course, the students will be able to

1. Understand the role of various agencies in disaster management and development
2. Identify the causes of earthquake and possible risk reduction measures
3. Analyze the distribution pattern of tsunami in India and possible risk reduction measures
4. Explain the structure and nature of tropical cyclones and their warning systems
5. Classify the Physiological hazards and Biological hazards.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 1 | - | 1 | - | - | - | 3 | 1 | - | - | - | - |
| **CO2** | 1 | - | - | 1 | - | 1 | 3 | - | - | - | - | - |
| **CO3** | - | 1 | 1 | - | - | 1 | 3 | - | - | - | - | - |
| **CO4** | - | 1 | - | 1 | - | - | 3 | 1 | - | - | - | - |
| **CO5** | 1 | - | 1 | - | - | - | 3 | - | - | - | - | - |

| **00OEXXX** | **ENTREPRENEURSHIP** | **L** | **T** | **P** |
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**Course Objectives:**

- To introduce nature, role and evolution of management.
- To impart knowledge on the purpose of planning, organizing and organization.
- To enhance leadership style and communication skill.
- To develop the skills required for an entrepreneur.
- To teach about project management.

**UNIT – I**

Meaning – Characteristics of management – Nature of management – Process of management – Functional areas of management – Management and administration – Role of management – Level of management – Evolution of management.

**UNIT – II**

Meaning - Nature of planning – Importance of planning – Types of planning – Steps in planning – Decision making – Meaning and definition of organizing – Steps in organizing – Nature of organization – Organization structure – Purpose of organization – Principles of organization – Delegation of authority – Nature and importance of staffing.

**UNIT – III**

Meaning and nature of direction – Principles of directing – Leadership and leadership style – Motivation – Communication – Need and feedback in communication – Importance of communication – Channels of communication – Types of communication – Forms of communication.

**UNIT – IV**

Evolution of concept of entrepreneur – Concept of entrepreneur – Characteristics of entrepreneur – Distinction between entrepreneur and manager – Technical entrepreneur – Charms of being an entrepreneur – Types of entrepreneur – Role of entrepreneurship in economic development – Barriers in entrepreneurship.

**UNIT – V**

Meaning of project – Project classification – Project identification – Meaning and significance of project report – Contents of a project report – Formulation of project report – Planning commission guidelines – Identification of opportunity – Project feasibility study.

**Text Books:**

1. Veerabhadrappahavinal, Management and entrepreneurship, New age International, New Delhi, 2008.
2. Peter f. Drucker; Innovation and entrepreneurship, Butterworth – Heinemann, London, 1985.

**Reference Books:**

1. **"**Creativity, innovation, entrepreneurship and enterprise in construction and development", University of Reading, Alan Barrell – Entrepreneur in Residence Entrepreneur in Residence, University of Xiamen, Xiamen 2012.
2. "Entrepreneurship Studies", National University Commission ( Nigerian University System), 2010.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Describe the nature, role and evolution of management.
2. Understand the purpose of planning, organizing and organization.
3. Communicate freely with others.
4. Acquire the skills required for an entrepreneur.
5. Identify project and formulate project report.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | - | - | - | - | - | - | - | - |
| **CO2** | 2 | - | - | - | - | - | - | - | - | 2 | - | - |
| **CO3** | 2 | - | - | - | - | 2 | - | 2 | - | 2 | - | - |
| **CO4** | 2 | - | - | - | - | 1 | - | - | - | - | - | - |
| **CO5** | 2 | - | 1 | - | - | - | - | 1 | - | - | 1 | - |

| **00EXXX** | **HUMAN RIGHTS** | **L** | **T** | **P** |
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**Course Objectives:**

- To understand about historical and theoretical Human Rights.
- To acquire knowledge on Universal Declaration of Human Rights.
- To describe the U.N. Human Rights declaration.
- To instruct the International Human Rights in Domestic courts.
- To understand contemporary issues on Human Rights.

**UNIT-I**

Definition of Human Rights - Nature, Content, Legitimacy and Priority - Theories on Human Rights - Historical Development of Human Rights.

**UNIT-II**

International Human Rights - Prescription and Enforcement upto World War II - Human Rights and the U .N .O. - Universal Declaration of Human Rights - International Covenant on Civil and Political

Rights - International Convenant on Economic, Social and Cultural Rights and Optional Protocol.

**UNIT-III**

Human Rights Declarations - U.N. Human Rights Declarations - U.N. Human Commissioner.

**UNIT-IV**

Amnesty International - Human Rights and Helsinki Process - Regional Developments -European Human Rights System - African Human Rights System - International Human Rights in Domestic courts.

**UNIT-V**

Contemporary Issues on Human Rights: Children's Rights - Women's Rights -Dalit's Rights - Bonded Labour and Wages - Refugees - Capital Punishment. Fundamental Rights in the Indian Constitution - Directive Principles of State Policy - Fundamental Duties - National Human Rights Commission.

**Text Books:**

1. Desai, A.R. Violation of Democratic Rights in India, Sage Publishers, 1986.
2. S. Hick, E. Halpin and E. Hoskins, Human Rights and the Internet, Springer Publishers, 2000.

**Reference Books:**

1. International Bill of Human Rights, Amnesty International Publication, London, 1988.
2. Human Rights, Questions and Answers, UNESCO, 1982
3. Mausice Cranston- What is Human Rights
4. Timm. R.W. - Working for Justice and Human Rights.
5. Human Rights, A Selected Bibliography, USIS.
6. Cheous K (Ed) - Social Justice and Human Rights (Vols 1-7).
7. Devasia, V.V. - Human Rights and Victimology.

**Course Outcomes:**

At the end of this course, the students will be able to:

1. Acquire the knowledge on theories of Human Rights
2. Predict the Civil, Political, Economic, Social and Cultural Rights
3. Recognize the Universal Human Rights
4. Classify the International Human Right System
5. Recognize the fundamental Rights and duties in the Indian Constitution.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 2 | - | - | - | - | - | - | 1 | - | - | - | - |
| **CO2** | 2 | - | - | - | - | - | - | 1 | - | - | - | - |
| **CO3** | 2 | - | - | - | - | - | - | - | - | 1 | - | - |
| **CO4** | 2 | - | - | - | - | - | - | 1 | - | - | - | - |
| **CO5** | 2 | 1 | - | - | - | - | 1 | - | - | 1 | - | - |

| 00OEXXX | NATIONAL SERVICE SCHEME | L | T | P |
|---|---|---|---|---|
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**Course Objectives:**

- To introduce the fundamentals and structure of National Service Scheme.
- To provide in-depth knowledge related to the obstacles in National Integration.
- To impart knowledge about leadership qualities including legal awareness, career guidance, globalization and cultural impacts.
- To prepare the students to involve in special camping programme.
- To encourage the students to participate in NSS regular activities including non-formal education.

**UNIT-I: NATIONAL SERVICE SCHEME**

A) History and its Objectives
B) Organizational structure of N.S.S. at National, State, University and College Levels
**C)** Advisory committee and their functions with special reference to college principal, Programme officer, N.S.S. group leader and N.S.S. volunteers in the implementation**.**

**UNIT-II: NATIONAL INTEGRATION**

A) Need of National integration
B) Various obstacles in the way of National Integration; such as caste, religion, language and provisional problems etc.

**UNIT-III: SPECIAL PROGRAMME**

A) Legal awareness
B) Health awareness
C) First-aid
D) Career guidance
E) Leadership training - cum - Cultural Programme
F) Globalization and its Economic Social Political and Cultural impacts.

**UNIT-IV: SPECIAL CAMPING PROGRAMME**

A) Nature and its objectives
B) Selection of camp site and physical arrangement
C) Organization of N.S.S. camp through various committees and discipline in the camp.
D) Activities to be undertaken during the N.S.S. camp.
E) Use of the mass media in the N.S.S. activities.

**UNIT-V: N.S.S. REGULAR ACTIVITIES**

A) Traffic regulation
B) Working with Police Commissioner's Office
C) Working with Corporation of Chennai
D) Working with Health Department
E) Blind assistance
F) Garments collection
G) Non-formal education
H) 'Environmental Education, Awareness and Training (EEAT)'
I) Blood donation

**Text Books:**

1. National Service Scheme Manual, Government of India, 2006.
2. Training Programme on National Programme scheme, TISS.

**Reference Books:**

1. Orientation Courses for N.S.S. Programme officers, TISS.
2. Case material as Training Aid for field workers, Gurmeet Hans.
3. Social service opportunities in Hospitals, KapilK.Krishan,TISS.
4. Social Problems in India, Ram Ahuja.

**Course Outcomes:**

At the end of this course, the students will be able to

1. Apply the services of National Service Scheme to the society.
2. Classify the obstacles in National Integration.
3. Develop leadership qualities.
4. Organize special camping programme.
5. Propose NSS regular activities through non-formal education.

| Mapping of Course Outcomes with Programme Outcomes | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** |
| **CO1** | 3 | - | 1 | - | - | 1 | - | - | - | - | - | - |
| **CO2** | 3 | 2 | 2 | - | - | 2 | - | 2 | 2 | 2 | - | 1 |
| **CO3** | 3 | 2 | 2 | 2 | - | 2 | - | 2 | 2 | 2 | - | - |
| **CO4** | 3 | 2 | 2 | 1 | - | 2 | - | - | 2 | 2 | - | - |
| **CO5** | 3 | 2 | 2 | 1 | - | 2 | - | - | 2 | 1 | - | 1 |

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